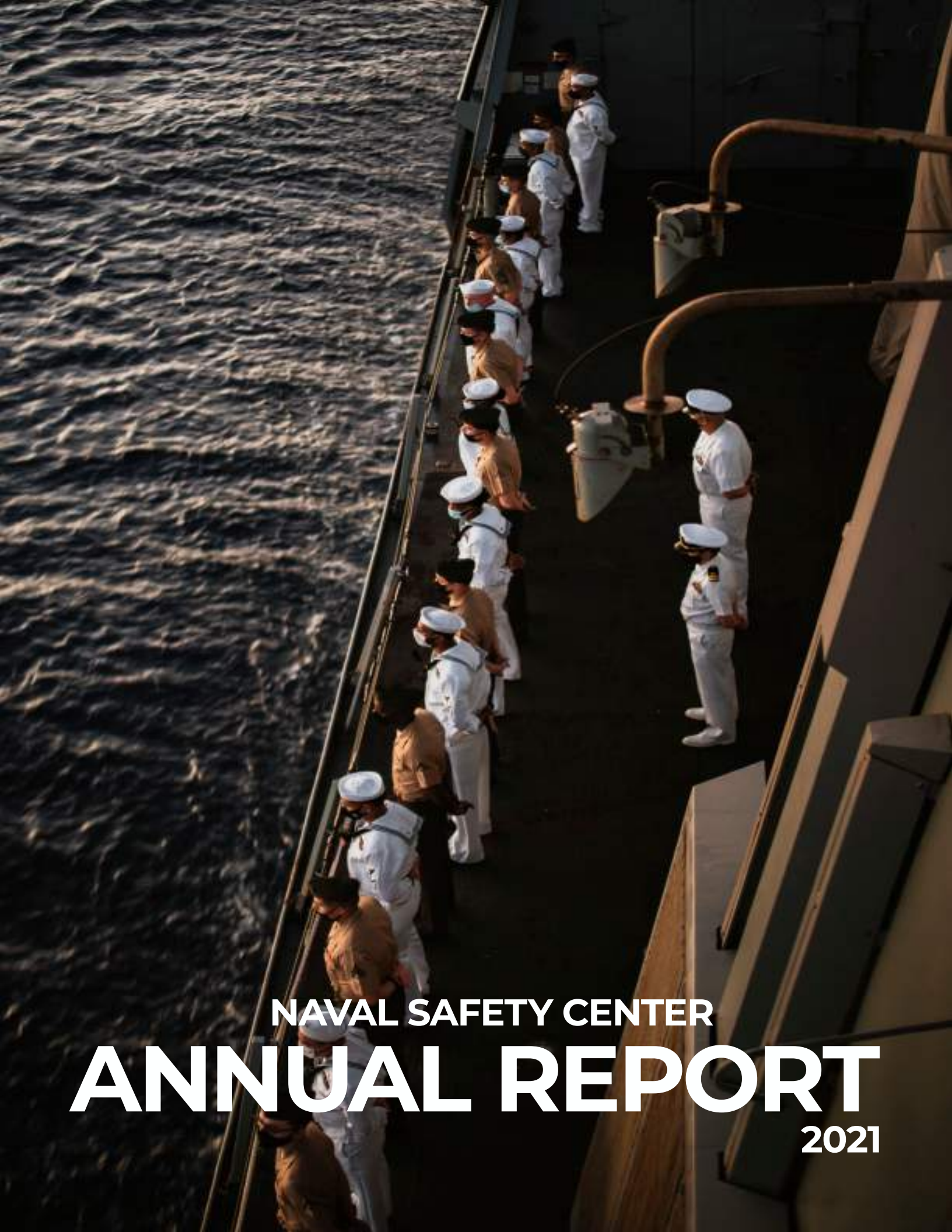

NAVAL SAFETY CENTER

ANNUAL REPORT

2021

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COMMAND MISSION STATEMENT

To preserve warfighting capability, combat lethality, and readiness by working with our stakeholders to identify, mitigate or eliminate hazards in order to reduce unnecessary risk to people and resources.

OUR VISION

We are the safety conscience of the Navy and Marine Corps charged with identifying unmitigated risk and policing the Naval Enterprise's risk adjudication processes. We use all available technologies and methods to compile information, identify risk, and propose mitigation strategies. We are agile in our processes, capable of flexing to our stakeholders' demands to provide world-class customer service. We actively align to the safety management system pillars and principles to accomplish our mission.

Safety Policy

- We are subject matter experts who develop the policies and regulations for the Naval Enterprise providing the fundamental foundations of the safety management system.
- We are experts in our fields, fluent in all higher guidance in pursuit of providing the best service to our stakeholders.

Safety Risk Management

- We capitalize on our staff's diversity of experience to develop experts in all areas of risk management and control across the Naval Enterprise.
- We actively collect data from all available sources to create data-driven recommendations for risk reduction throughout the Naval Enterprise.
- We work with stakeholders to develop effective risk mitigation strategies.

Safety Assurance

- We identify risk to stakeholders through direct and indirect observation.
- We monitor stakeholder risk adjudication processes until risks are eliminated, mitigated, or formally accepted at the appropriate level.

Safety Promotion

- We are responsible for providing world-class safety related training to the Naval Enterprise.
- We communicate with all levels of the Naval Enterprise for the greatest effect.

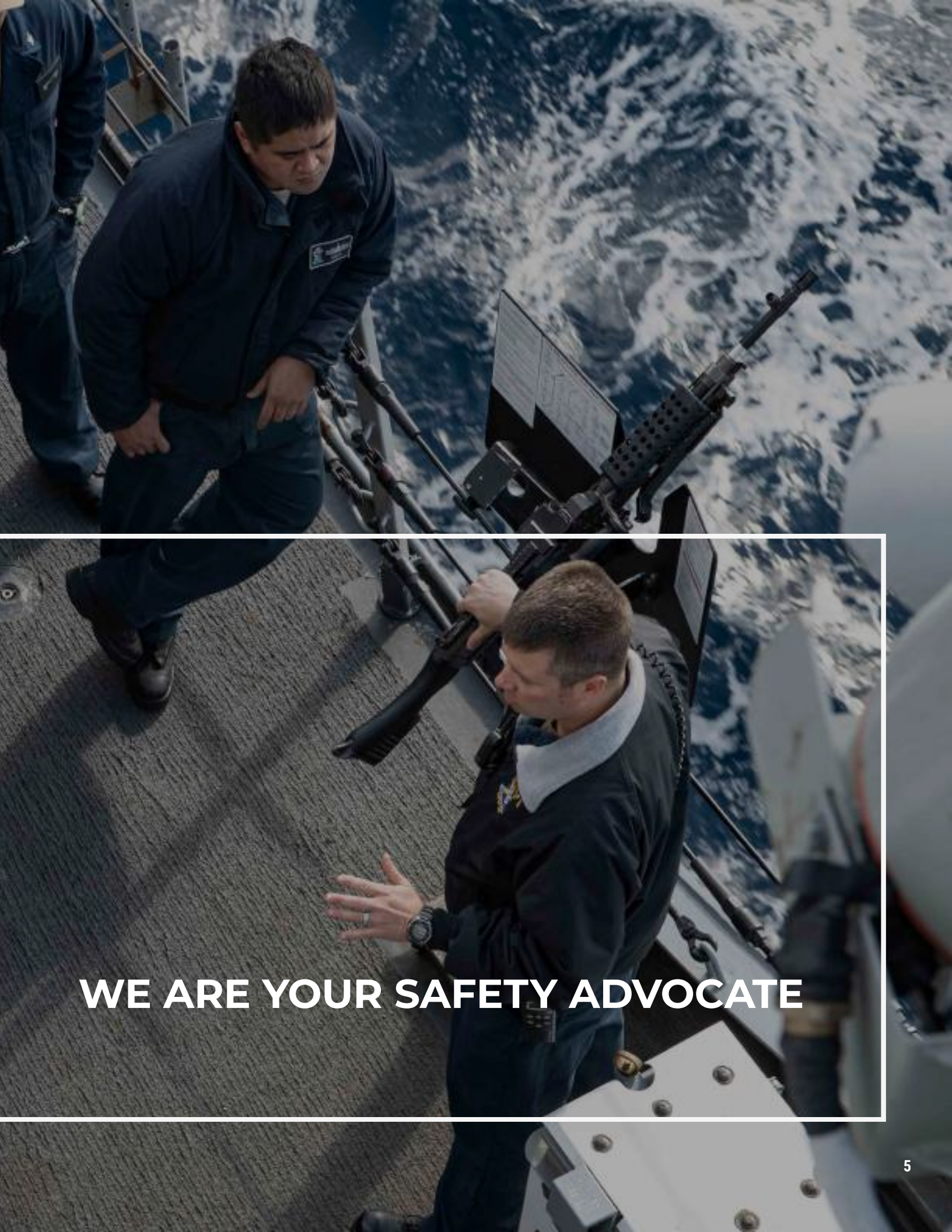
OUR 2021 LINES OF EFFORT

The Naval Safety Center (NAVSAFECEN) set three lines of effort (LOE) to establish the command's high-interest priorities, and underlying actions over the course of 2021. These LOEs aligned with Navy senior leader's focus on data and standardization of safety and risk management principles.

LOE 1: Digital Transformation – Identify and implement innovative digital processes, tools, and applications to enhance business practices and improve overall effectiveness in meeting the Naval Safety Center's mission requirements.

LOE 2: Risk Management Rebranding – Rebrand Operational Risk Management to Risk Management, resulting in enhanced applicability and relevance to the naval enterprise.

LOE 3: Safety Professional Development – Develop Safety Professionals throughout the naval enterprise by refining and aligning employees' educational and qualification requirements to further enhance support to the naval enterprise.



WE ARE YOUR SAFETY ADVOCATE

F.R. "LUCKY" LUCHTMAN

COMMANDER'S STATEMENT

The year 2021 resonated with accomplishments as we continued navigating the Coronavirus-19 (COVID-19) pandemic. We built on the successes of 2020, ever mindful of our enduring commitment to provide a safety center of excellence to our Navy and Marine Corps stakeholders.

Three lines of effort (LOE) guided our focus and priorities over the year – LOE-1 Digital Transformation, LOE-2 Risk Management Rebranding, and LOE-3 Safety Professional Development. The LOEs instilled a sense of pride and ownership within our organization, and created a framework where our collaborative work yielded tangible, quality results and products.

The COVID-19 pandemic continued impacting NAVSAFECEN operations and mission execution during 2021. Although travel restrictions periodically limited safety assessments of fleet units, our team adapted and completed 123 assessments for the naval enterprise. Despite the effect COVID-19 had on our assessment schedule and work environment, our team took the helm and as always, accomplished our mission.

LOE 1. Our commitment to Digital Transformation ensured the sustained effectiveness of our organization while our staff maintained a seamless telework and office hybrid schedule. The delivery of new cloud technology-enabled capabilities coupled with command-wide adoption advanced an accelerated transition to digital processes, and allowed digital strategy to permeate every aspect of command organization, operations, and behaviors.

- By March 2021, we developed the "Quarterdeck," a comprehensive, collaborative online environment featuring a single entry point for all command business, and enabling streamlined processes, standardization, and authoritative sources.
- Our user adoption rate exceeded typical industry and Department of the Navy averages, and by Dec. 31, 2021, our staff achieved 98% fully enabled remote staff capabilities.

LOE 2. Our efforts to invigorate risk management principles and processes led to our Risk Management Rebranding initiative to enhance applicability and relevance to the naval enterprise. The team made significant revisions to a draft OPNAVINST 3500.39D, however we placed a pause on this LOE as we worked through changes resulting from the Major Fires Review (MFR).

LOE 3. We launched our third LOE to refine and align Safety Professionals' competencies across the naval enterprise. Over the year, our team made substantial progress to collect details for all types of safety professionals across all warfare communities, safety instructors, and NAVSAFECEN staff members. The team also looked at whether the core competency training requirements for safety professionals adequately aligned with higher-level requirements. This fact-finding phase significantly informed the way forward.

RMI. We made substantial progress in training and transitioning the naval enterprise from the Web-Enabled Safety System (WESS) to the Risk Management Information (RMI) Streamlined Incident Reporting (SIR) system and focusing on the next phase of the RMI SIR initiative; completing the build-out of various capabilities, training, and testing across platforms.

The RMI schema facilitated the WESS-transferred data into actionable information, enabling personnel to better understand the hazards and risks associated within their operations and processes, and allowing for improved risk decision-making and mishap reduction. RMI linked multiple authoritative data sources allowing information-sharing across the Navy, improved the quality and accessibility of RMI associated with naval safety.

BHR Fire, MFR Report. One of our most enduring accomplishments centered on our efforts following USS Bonhomme Richard (LHD 6) (BHR) fire. The command played a significant role in the Major Fires Review (MFR), a comprehensive historical review of major fires aboard U.S. Navy ships.

In our analysis, NAVSAFECEN identified multiple recurring trends in the causal factors of 15 shipboard major fire-related events over a 12-year period that culminated with the BHR fire. The command had an integral role in a resulting VCNO-directed MFR Board, and in developing findings and recommendations for the final report. Ultimately, the MFR and final report resulted in the DON's decision to transform the safety center into the Naval Safety Command.

As we lean forward into 2022, our team remains committed to the safety and health of the nation's Sailors, Marines, civilians, and contractors.

With Naval Safety Command established in February 2022, we are elevating the role of risk management. We will direct our focus toward further implementing a comprehensive SMS to provide defense-in-depth and ensure the Naval Enterprise is safe to operate and operating safely. In line with the CNO's "Get Real, Get Better" initiative, we are committed to providing the tools and resources our enterprise leaders need to better understand and control risk, and develop teams that are self-aware, self-assessing, and self-correcting. We remain committed to enabling warfighting readiness.

EXECUTIVE SUMMARY

This annual report highlights the Naval Safety Center's (NAVSAFECEN) progress, trends, and results achieved in 2021 despite the continued challenges presented while operating in a constrained COVID-19 environment.

The NAVSAFECEN is an Echelon II command reporting directly to the chief of naval operations and is the Department of the Navy's (DON) safety administrator across the naval enterprise. The center is comprised of roughly 225 military, civilian, and contracted employees across six directorates, four departments, and two tenant commands.

2021 MISHAP TRENDS

Human factors and non-compliance continued to be significant factors in Navy and Marine Corps mishaps in 2021.

Aviation Mishaps

- In FY21, naval aviation saw an overall rise in the number of mishaps. Class A events were at 15 compared to 14 in FY20. Class B mishaps jumped significantly from 27 to 40. Rising component cost when compared to the threshold for Class B mishaps may have played a part in the rise of Class B reporting.
- While there was a slight overall rise in the number and rate of mishaps within USMC aviation, there were no Class A flight mishaps in FY21. This is the first time this has occurred since naval aviation began recording aviation mishaps.
- FY21 squadron and facilities assessments reported a continuation of common issues and negative discrepancies found in FY20, the most common being non-compliance, insufficient manning, and inadequate resources.
- Human factors remain the most significant contributor to mishap rates across all platforms and communities, with complacency and policy non-compliance rating highest among causal factors.

Shore Mishaps

- The majority of FY21 shore military mishaps involved physical training or recreational activities and transportation accidents, both at 16%. Distraction and situational awareness, and policy or procedure violations each accounted for 12% of military mishaps.

Afloat Mishaps

- The afloat community reported 531 mishaps over three years between FY19-21. Leading these trends each year were electrical mishaps, 74 of which occurred in 2021. Fire-related mishaps came in second with 32 of 98 reported in 2021.

Expeditionary Mishaps

- While most communities reported a slight increase in mishaps in 2021 compared to 2020, the overall rate of Class A-E mishaps from 2017-2021 indicated a continued, overall positive trend.

The year 2021 turned out to be a very dynamic and quickly evolving one for our organization. We began the year focusing on our three lines of effort: Digital Transformation, Safety Professional Development, and Risk Management Rebranding; and continuing the functional expansion and training for Risk Management Information Streamlined Incident Reporting (RMI SIR), which rolled out in August 2020.

Simultaneously, several of our directorates were continuing work on a historical review of 15 major shipboard fires occurring over a 12-year time frame, which culminated with the catastrophic fire aboard USS Bonhomme Richard (BHR) (LHD 6) in July 2020.

Based on this initial Major Fires Review (MFR), our staff prepared and released a Safety Assurance Letter in January 2021 to fleet commanders and commanders, Naval Sea Systems Command (NAVSEA) and Naval Installations Command (CNIC), discussing major shipboard fire trends. This led to a vice chief of naval operations (VCNO) tasking for the fleets to work with NAVSAFECEN, NAVSEA, Naval Reactors, and CNIC to perform a deep dive on the historical record to understand and address systemic issues underlying the persistence of shipboard fire mishaps and recommend actions to establish the necessary culture and standards required to change Navy fire safety outcomes in an enduring way.

The MFR Board was established, and included NAVSAFECEN mishap investigators along with U.S. Fleet Forces Command (USFFC) and U.S. Pacific Fleet (PACFLT).

The findings and recommendations from the final BHR investigation and MFR reports (released October 2021) led to significant transformational policy and structural changes in NAVSAFECEN's mission, functions and roles and how it will operate going forward to include its designation from "center" to "command." *

Afloat investigators also assisted in the VCNO's high-visibility tasker, the Navy Fire Culture Project, which evolved from the MFR Board. This project involved coordinating and working internally and with external commands, NAVSEA and USFFC, to focus on the cultural issues related to fleetwide fires that occurred at sea and in port during private and public availabilities.

While some planned policy updates were paused during the MFR analysis, continuous improvement of safety policy, programs, and safety professional development remained top priorities in 2021.

Throughout the year, NAVSAFECEN staff conducted detailed and comprehensive research and fact-finding to further develop training curriculum.

Significant milestones included the nascent Navy Safety Professional Certificate Program and the initiation of the Navy Safety Professional Level 1 pilot course, with 12 candidates successfully qualified for Safety Professional Level 1 credentials during the first two Safety Professional Certificate boards.

The Naval Safety and Environmental Training Center (NAVSAFENVTRACEN) marked a notable milestone in October when the Commission of the Council on Occupational Education (COE) approved the center's request for candidate status, bringing NAVSAFENVTRACEN one step closer to accreditation.

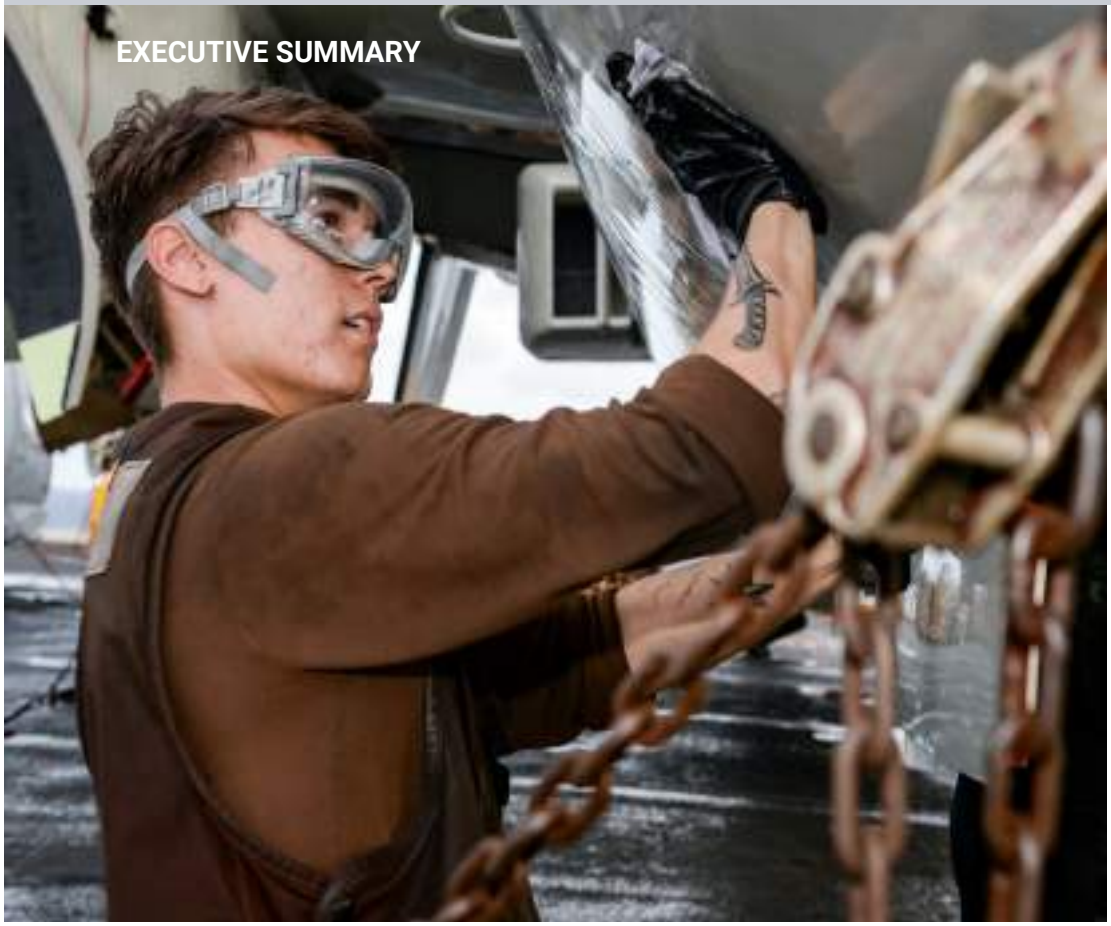
The commission's approval for candidacy allows NAVSAFENVTRACEN to move forward toward becoming a COE-accredited institution, recognizing the training center for meeting or exceeding the COE's criteria for educational standards and student achievement.

Our third line of effort for 2021 focused on Safety Professional Development. Spearheaded by our shore safety team, this initiative laid out a roadmap to refine and align the education and qualification requirements for our Navy safety advocates and professionals.

To develop and complete recommendations and proposed changes to the policy, a cross-functional team of our senior warfare community representatives performed a comprehensive finding of fact that included identifying all safety advocates and professionals across the naval enterprise, mapping higher-level requirements to competencies, comparisons with other full-time and collateral-duty personnel, benchmarking private industry training, and formal schoolhouse reviews.

Another milestone involved significant changes to the Navy's Traffic Safety Program. NAVSAFECEN facilitated the Navy's High-Velocity Outcome Task Force (HVOTF) and, with support from USFFC, PACFLT, CNIC, Bureau of Medicine and Surgery, and Navy Reserve Forces Command, researched alternative training methods to educate Sailors and Marines, save lives and reduce training costs pertaining to motorcycle safety. The top three courses of action that could deliver quality, cost-effective motorcycle training to service members were then sent to all Echelon II commands for flag officer selection and concurrence.

** To read the Major Fires Review report, go to "BHR and MFR Investigations" at www.secnavy.navy.mil/foia/readingroom/HotTopics/AllItems.aspx*



Our shore team participated in the Joint Services Safety Council's (JSSC) motor vehicle working group (MVWG), which was tasked with recommending updates to Department of Defense (DoD) Instruction 6055.04, DoD Traffic and Motor Vehicle Safety. The MVWG introduced section 4, Tactical Vehicle Safety, which was accepted by the JSSC and signed into effect by the Office of the Under Secretary of Defense for Personnel and Readiness. We further developed numerous processes and products to ensure the smooth transition from the Web-Enabled Safety System (WESS) to RMI.

Additionally, the NAVSAFECEN coordinated with partner nation, interagency, DoD, and naval stakeholders to identify and mitigate risks facing the naval aviation enterprise. This mitigation included developing and executing 13 corporate nondisclosure agreements, two memorandums of understanding with DON partners, and 78 individual NDA applicants.

Our efforts integrating the RMI SIR system continued to be one of our primary risk management focus areas in 2021, with an emphasis on training the naval enterprise on its use and transitioning 300,000 safety data records from the legacy WESS to RMI. As a consolidated safety system, RMI made it easier for Navy and Marine Corps personnel to report mishaps and provided more authoritative data to improve readiness.

One of our main priorities was ensuring users had access to comprehensive tutorials, guides, and hands-on training to help increase their understanding and proficiency in RMI and improve the accuracy of their reporting. We engaged in sea and in port testing of RMI bandwidth and continued expanding our capabilities in data visualization and quality control processes for the system.

Our team also built predictive models for Class A and B mishaps, and Class C aviation ground mishaps, which were used to provide risk assessments for four carrier strike groups and five ships. We also collaborated with the U.S. Army to develop Navy mishap vignettes for the Joint Risk Assessment Tool. The tool is an interactive, web-based application that helps the services apply risk management.

The Navy vignettes give our Sailors and Marines an idea on how to look at hazards, put controls in place for those hazards, and move toward mission accomplishment. Despite periodic restrictions on travel in 2021, the organization performed roughly 123 assessments in 2021.

The aviation safety team tracked 1,557 mishap and hazard recommendations for adjudication and implementation, and the afloat safety team closed 110 Class A mishap recommendations. Our mishap investigations team convened 52 Class A/Explosive Safety Investigation Boards.

The NAVSAFECEN distributed a range of communication products and provided in-person and expanded virtual training across the naval enterprise.

- Aviation Safety assisted CNAF's development of the 2022 Safety Campaign Plan and actively supported its execution with aviation safety-focused messages and scenarios to increase fleet situational awareness and risk management efforts.
- Key to safety, the Safety Promotions Division launched several safety campaigns and training initiatives geared toward motor vehicle safety awareness and maintaining a positive risk management mindset.
- The NAVSAFECEN performed numerous data-based case studies in 2021, including a focused study on motorcycle fatalities. Our analysis of motorcycle mishaps compared the rate of motorcycle mishaps for the Navy and Marine Corps to the general U.S. population. The study's results revealed Navy and Marine Corps males in the 18-24 age group suffered fatality rates that are statistically higher than the U.S. population. The Marine Corps also showed fatalities among males in the 25-29 age group were statistically significantly higher. All other fatality rate differences between service members and the U.S. population were not statistically significant.

Our Digital Transformation LOE allowed us to maintain nearly seamless operations regardless of fluctuations in Health Protection Conditions for our region; our investment in cloud computing practices and processes ensured our staff were able to work efficiently in office, from home, or on the road.

Data visualization and quality control was an area of significant focus in 2021, and we are currently working with customers across the enterprise to customize reporting dashboards to improve the quality and accuracy of the user experience going forward.

We remain the Navy and Marine Corps' safety advocate, working tirelessly to promote Sailor, Marine, and civilian safety and ensure operational readiness. We are committed to providing relevant, timely, and improved analytical data and communication products, and to quickly disseminate accurate and relevant information. We recognize we are at the tip of the sword in the enduring efforts we undertake in the safety environment.

Note: On Feb. 4, 2022, the Naval Safety Command was established, replacing the Naval Safety Center.

Our 2021 accomplishments and highlights under the Navy Safety Management System Pillars

SAFETY POLICY

Guiding Principles

- We develop the policies and regulations for the naval enterprise, providing the fundamental foundations of the Safety Management System (SMS).
- We are experts in our fields, fluent in all higher guidance in pursuit of providing the best service to our stakeholders.

Highlights

- Continued developing Risk Management Information Streamlined Incident Reporting (RMI SIR) policies and procedures, including numerous processes and products to ensure a smooth transition from the methodologies used during the Web-Enabled Safety System's tenure.
- Developed RMI-specific quality control and operating guides that provided the framework for all the underlying procedural guides generated by the Naval Safety Center (NAVSAFECEN) codes.
- The Aviation Safety Directorate influenced multiple policy updates and instructions, including two COMNAVAIRFORINST 4790.2D Naval Aviation Maintenance Program Standard Operating Procedure updates, one COMNAVAIRFORINST 5100.5 Naval Air Forces Safety Management System update, and the NAVAIR 00-80T-123 Aircrew Systems NATOPS Manual.
- Continued Physiological Episode (PE) Operating Guide updates and relevant policy to further improve a comprehensive process that standardizes the reporting and investigation of PEs across all applicable naval aviation platforms. The establishment of 2021's PE Quicklook proved extremely popular, efficient, and was a major improvement to the reporting process.
- Updated and republished OPNAV 3750 Flip Series Guide for aviation mishaps.
- Completed changes to OPNAV Safety Manual M-5100.23 (change 1), which was signed out May 26, 2021.
- Verified and updated OPNAV M-5100.23 Safety Program audit checklist and workplace inspection checklist. A letter of clarification and applicability was provided for OPNAV M-5100.23 Section A.
- The Shore Directorate led efforts in several O-6 rank and GS-15 or higher-level, program and policy reviews. These included: DoDIs 6055.04, 6055.05, and 6055.12, SECNAVINST 5100.16D, USMC SMS Vol 6, SOH MCO 5100.29C, OPNAVINSTs 11230.2B, 5102.1E, and 11240.8J CH-1.

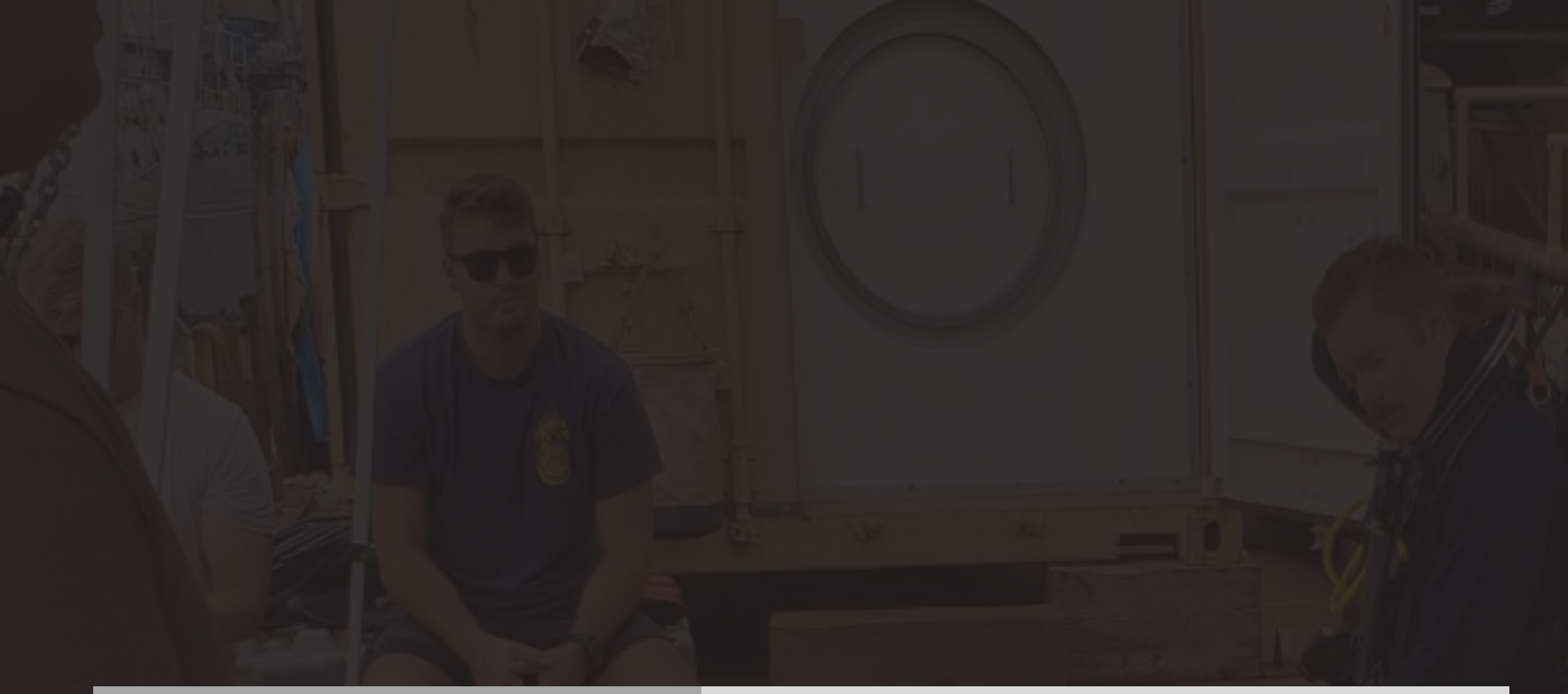
One area of focus for NAVSAFECEN was expanding and detailing partnerships and collaborations with private industry and other Department of Defense (DOD) partners to enhance analytical support for naval platforms and procedures.

- We developed and coordinated 93 reciprocal information-sharing agreements with DOD, non-DOD governmental, academic, and commercial partners to enhance analytical support for naval platforms and procedures. Worked hand-in-hand with U.S. Coast Guard and DOD partners to share common platform information to increase safety awareness and collaboration across the services.
- In coordination with Naval Air Systems Command (NAVAIR) and naval enterprise stakeholders, reviewed and endorsed 41 NATOPS manual changes affecting nearly every naval aircraft type/model/series, naval airfield operations and carrier-based operations.
- As members of the Joint Services Safety Council's (JSSC) motor vehicle working group, which was tasked with recommending updates to the DoD Traffic and Motor Vehicle Safety DoDI 6055.04, the group introduced "Section 4, Tactical Vehicle Safety," which was accepted by the JSSC and signed into effect by the Office of the Under Secretary of Defense for Personnel and Readiness.

The Shore Safety Directorate championed the NAVSAFECEN Line of Effort (LOE) Safety Professional Development, which assessed and developed safety professionals' competencies throughout the naval enterprise.

This LOE focused on the knowledge and skillsets of our safety advocates and professionals by refining and aligning their education and qualification requirements to further enhance support to the naval enterprise.

- A cross-functional team of senior warfare community representatives performed an exhaustive finding of fact to identify all safety advocates and professionals across the naval enterprise, mapping higher-level requirements to competencies, comparisons with other full-time and collateral-duty personnel, benchmarking private industry training, and formal schoolhouse reviews to complete recommendations and proposed changes to the policy.



SAFETY RISK MANAGEMENT

Guiding Principles

- We capitalize on our staff's diversity of experience to develop experts in all areas of risk management and control across the naval enterprise.
- We actively collect data from all available sources to create data-driven recommendations for risk reduction throughout the naval enterprise.
- We work with stakeholders to develop effective risk mitigation strategies.

Highlights

One of the Naval Safety Center's principal efforts in 2021 was the continued build-out and refinement of the Risk Management Information Streamlined Incident Reporting (RMI SIR) system tools and processes. The RMI SIR makes it easier for Navy and Marine Corps personnel to report mishaps, and provides more authoritative data to help improve safety conditions.

Since its implementation in August 2020, RMI has provided personnel with an enterprise view of all information necessary to focus on total loss prevention and control as a means to improve readiness. RMI enabled the data transition into actionable information, enabling all personnel to understand better the hazards and risks associated with their operations and processes.

RMI SIR Highlights

RMI linked multiple authoritative data sources allowing sharing of information across the Department of the Navy (DON).

- RMI successfully migrated Web-Enabled Safety System (WESS) incident reporting data - over 300,000 WESS data records - into the RMI data schema, allowing users access to previous safety investigation reports (SIR) dating back to 1986 for aviation events and 2004 for all other safety events.
- Participants used RMI in Trident Warrior 21, conducting pierside and underway testing of the bandwidth used by RMI SIR aboard two guided missile destroyers (DDGs) and one nuclear aircraft carrier (CVN). The test plan included conducting tests pierside to establish a baseline for comparison, testing in the current state of Automated Digital System (ADNS) quality of service (QoS), and testing in an upgraded ADNS QoS state.
- The NAVSAFECEN staff built models for predicting the risk of Class A/B flight mishaps and Class C aviation ground mishaps (AGM), and used shipboard maintenance history to predict mishaps. The team used these new models and the existing Class A/B afloat mishap prediction models to provide risk assessments for four carrier strike groups with their assigned carrier air wings at Commander, Naval Air Forces' request, and for five individual ships of interest to Commander, Naval Surface Forces.
- In addition to model documentation, the team researched and drafted studies on the use of Battle "E" award winners in the model construction process and the seasonality of operations that require accounting for when training models. The team refined feature generation and model building scripts and established high-performance computing processes to reduce the time required to train new models.
- NAVSAFECEN's knowledge management team worked on several ad-hoc projects such as risk mitigation following the inception of the APG-79 radar, wearable health monitoring systems, and re-categorization of mishap causal factors.
- Aviation personnel submitted dozens of RMI feedbacks to correct errors and enhance system effectiveness.

Risk Management Training

- Since RMI SIR was new to the fleet, additional training was needed. The shore safety team delivered over 60 hours of online training to over 150 Navy and Marine safety professionals through Adobe Connect.
- The aviation safety team provided additional guidance and tools to support training the enterprise.
- The Inspection and Hazard Abatement (I/HA) modules were released, providing 43 training classes with 460 personnel trained.
- As subject matter experts, the Afloat Safety Directorate performed quality control for over 2,000 afloat mishap and incident reports, ensuring all data was entered accurately and enabling access to data necessary for analysis by NAVSAFECEN investigators and other directorates.
- Shore Safety provided SME analysis on two-wheel, private motor vehicle (PMV-2) mishap data during COVID-19, Under Reporting of Fall Hazards in the Enterprise Safety Applications Management System (ESAMS), Energized Work Permits, Respiratory Protection fit testing, and At-Risk Shore Commands.
- Aviation Safety provided aircraft, maintenance, ordnance, and aeromedical expertise and analysis to the naval aviation enterprise (NAE), Office of Legislative Affairs, and the fleet as a whole. The team provided real-time assistance and training, analysis, and product generation.

Additional Highlights

- Aviation Safety synthesized assessment, explosives safety inspections, shipboard inspection data, and RMI hazard and mishap data to improve the weapons safety awareness of fleet operational units and activities. This support included in-person participation in two mishap training seminars that ensured alignment between the Naval Ordnance Safety and Security Activity and OPNAVINST 5102 and 3750 reporting requirements.
- The directorate participated in a combined Commander, Naval Air Forces, Center for Naval Analyses, and Naval Safety Center Performance to Plan effort to continue addressing AGMs within the NAE. The team focused on shipboard aircraft move and taxi mishaps, and as a result of advanced analytics, determined the aircraft director and tow tractor operator experience, or lack thereof, highly correlated with shipboard AGMs.
- The directorate coordinated with the U.S. Air Force's deputy chief of staff for operations (A3) and Naval Air Systems Command's PMA-202 (Aircrew Systems) to produce Aircrew System Advisory 21-08, which provided data to mitigate a manufacturing defect on aircrew gunners' belts. If left uncorrected, the affected gunners' belts could have led to fatal mishaps.

USS BONHOMME RICHARD (LHD 6)

July 13, 2020

SAFETY ASSURANCE

Guiding Principles

- We identify risk to stakeholders through direct and indirect observation.
- We monitor stakeholder risk adjudication processes until risks are eliminated, mitigated, or formally accepted at the appropriate level.

Highlights

One way the NAVSAFECEN serves its customers is through a well-rounded Safety Assurance program. The NAVSAFECEN measures compliance with standards, policies, directives, and procedures through audits, assist visits, human factors surveys and workshops, command and employee reporting; guides continuous improvement efforts; and promotes positive safety cultures.

The NAVSAFECEN employs a variety of tools and services to include assessments, conducting mishap investigations and safety investigation boards (SIB), tracking mishap recommendations (MISREC), holding safety analytics working groups (SAWG), and disseminating ALSAFE messages.

- In 2021, the center completed 48 aviation-related assessments, 12 afloat operational safety assessments (AOSA), and 68 expeditionary-related assessments.
- The organization convened 52 Class A/Explosive SIBs, and reviewed and adjudicated about 3,100 FY21 mishap and hazard reports (HAZREP), ensuring data standardization and accuracy, and tracked 1,557 MISRECs and hazard recommendations for adjudication and implementation.

Investigations

Major Fires Review (MFR), MFR Board; USS Bonhomme Richard (BHR) (LHD 6) Fire

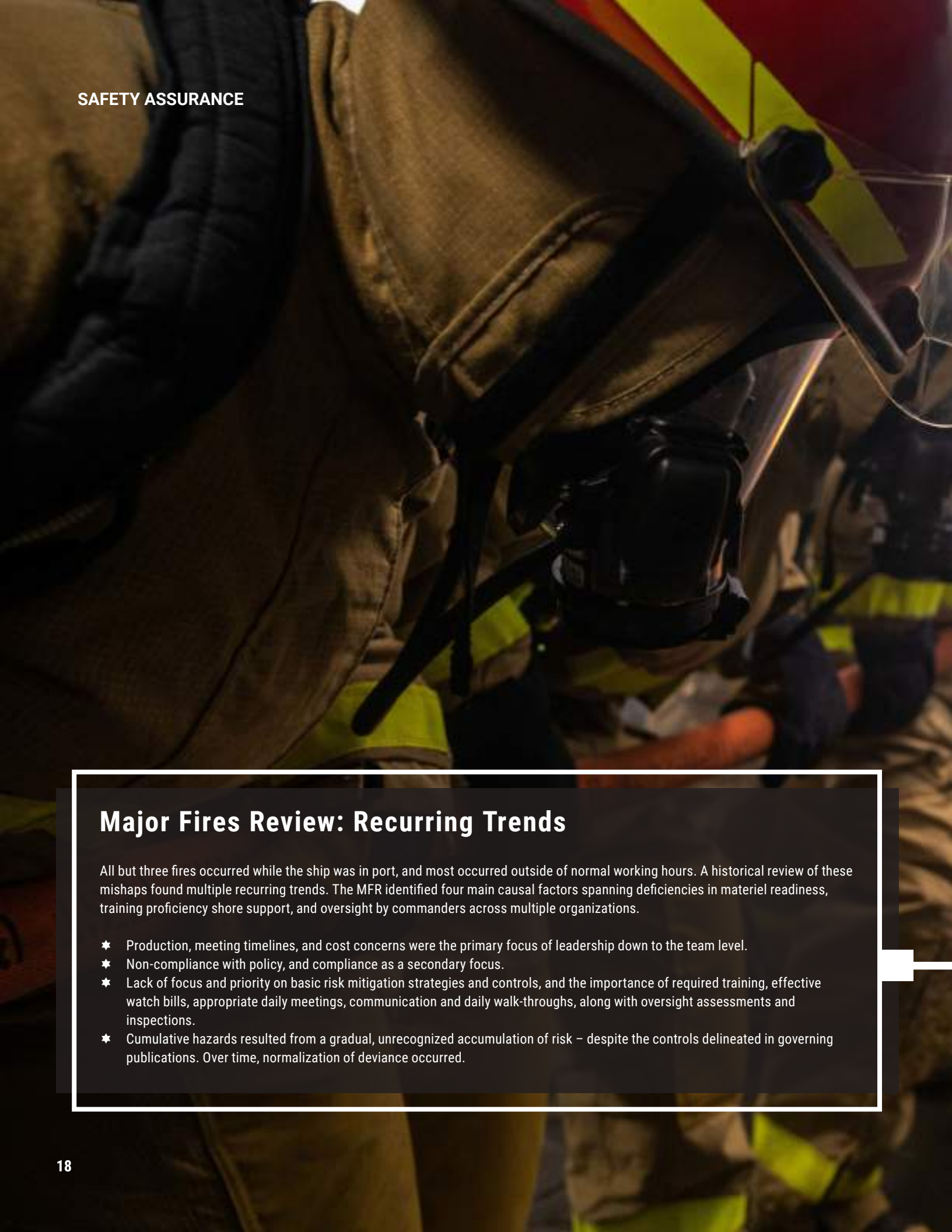
The USS Bonhomme Richard Safety Investigation Board (SIB) and the Major Fires Review, MFR Board and final MFR report were several of the most significant and impactful undertakings NAVSAFECEN accomplished in 2021.

The center provided a SIB on the BHR fire in July 2021. The BHR fire resulted in $3 billion in damage and a subsequent decision to decommission what would have been one of the U.S. Navy's most combat-capable amphibious assault ships. Early in the BHR investigation board, the center's Mishap Investigations Directorate launched a data-based, historical review of major fires aboard U.S. Navy ships.

This review identified multiple recurring trends in causal factors in 15 shipboard fire-related events – culminating with the BHR fire, occurring over a 12-year period. Based on this historical analysis, mishap investigators prepared a Safety Assurance Letter that was released by COMNAVSAFECEN in January 2021, and endorsed by the vice chief of naval operations (VCNO) to fleet commanders, and commanders, Naval Sea Systems Command (NAVSEA), and Naval Installations Command (CNIC).

In response to the NAVSAFECEN letter, the VCNO tasked the fleets to work with NAVSEA, Naval Reactors (NR), CNIC, and NAVSAFECEN to perform a deep dive into the historical records to understand and address systemic issues underlying the persistence of shipboard fire mishaps, and to recommend actions that establish the necessary culture and standards required to change Navy fire safety outcomes in an enduring way.

This action led to the Major Fires Review Board, in which the NAVSAFECEN led one of three teams in conducting a historical analysis of 15 major shipboard industrial fires and also had an integral role in developing findings and recommendations for the final report. Ultimately, the MFR resulted in the decision to transform the Naval Safety Center to the Naval Safety Command.



Major Fires Review: Recurring Trends

All but three fires occurred while the ship was in port, and most occurred outside of normal working hours. A historical review of these mishaps found multiple recurring trends. The MFR identified four main causal factors spanning deficiencies in materiel readiness, training proficiency shore support, and oversight by commanders across multiple organizations.

- Production, meeting timelines, and cost concerns were the primary focus of leadership down to the team level.
- Non-compliance with policy, and compliance as a secondary focus.
- Lack of focus and priority on basic risk mitigation strategies and controls, and the importance of required training, effective watch bills, appropriate daily meetings, communication and daily walk-throughs, along with oversight assessments and inspections.
- Cumulative hazards resulted from a gradual, unrecognized accumulation of risk – despite the controls delineated in governing publications. Over time, normalization of deviance occurred.

Adopted changes from NAVSAFECEN recommendations to MFR report included:

- Creation of a Learning to Action Board (L2AB) to track recommendations and ensure they are implemented. The L2AB is a Secretary of the Navy and Department of the Navy-level board that emphasizes a culture of learning. The center will play a direct role in helping the board assess the effectiveness of enterprise corrective actions.
- Echelon II and III audits to provide a full-scale look at risk management practices to answer how "gaps," defined as the "what is" to the "what should be," are addressed, mitigated, and communicated. These audits will look at areas through the lens of risk management – personnel, operations, maintenance, self-assessment, assessment of subordinates, certifications, waivers, etc., and evaluate the command's risk decision framework. Ultimately, we will assess the "work imagined, work done" gap by integrating assessment/inspection/certification team and unit-level spot check data to validate the effectiveness of Echelon II and III processes.
- Standardizing Assessments/Inspections/Certifications to enable dedicated evaluation of the assessment, inspection, and certification teams used by Echelon II, III, and IV commands.
- Echelon V Spot Checks allowing for unannounced visits to units (analogous to NR monitor construct) where we assess day-to-day standards. Emphasis will be on compliance, but the team will provide insight into the bigger picture of the system, combined with Echelon III and IV findings, to identify institutional gaps.

NAVSAFECEN Investigation Support

Shore Safety Directorate performed roundtable analysis and discussion for several mishap investigations. Final endorsements were submitted for USS Oscar Austin (DDG 79), Norfolk Naval Shipyard Bldg. 33, and USS Iwo Jima (LPH 2) fires.

Assessments

Safety assessments allow NAVSAFECEN personnel to evaluate the risk management and safety culture, as well as share and disseminate best practices, instructions, and lessons learned gained across the enterprise. Through continuous collection and trend analysis of multiple data streams, NAVSAFECEN evaluates the level of risk for Navy and Marine Corps units and leverages this information to determine the relative priority for a safety assessment.

These assessments help identify areas of unmitigated risk to the command pertaining to risk to mission and risk to force. Additionally, the assessments help ensure commands understand who can accept that risk within the command or when and how to elevate it to the next level in the chain of command.

- The Aviation Safety Directorate completed 37 aviation squadron safety assessments, and 11 air station and aviation facility safety assessments, providing a comprehensive look at how units operated, communicated, and used risk management during planning and execution.
- In coordination with Commander, Naval Air Forces (CNAF), Aviation Safety led a comprehensive evaluation of Chief of Naval Air Training (CNATRA), which included Echelons II-V site visits, detailed analytics, and culture assessments.
- The Expeditionary Warfare Directorate also accomplished more business than the previous year; completing 13 Navy and Marine Corps Airborne Safety Assessments, 43 Diving Safety Assessments (DSA), in addition to Expeditionary Operational Safety Assessments, and Operational Risk Management Assessments. The team also conducted three Diving Operational Readiness Inspections (DORI) on U.S. Coast Guard diving commands.
- Persevering through COVID-19 restrictions, the afloat safety team completed 12 assessments, including comprehensive events for Carrier Strike Group ELEVEN (USS Nimitz) and Expeditionary Strike Group THREE (USS Makin Island), providing critical insights to commanding officers.
- In 2021, Afloat Safety assessed how AOSA data is collected, displayed, and used for improvement recommendations. This initiative aimed to provide command-level leadership with direct and easy-to-read reports that identify trends and areas of concern over time (i.e., risk mitigation practices, procedural compliance, and historical mishap areas within ship and class life cycles).
- New graphics, more data points, and a new ASOA final report were drafted for consideration. The aim was to incorporate analysis and information from other Navy inspections into the ASOA process to become proactive and provide areas of focus within different levels of afloat forces (such as squadrons and type commands (TYCOMs)).
- The shore safety team provided safety assurance support for Naval Inspector General (NAVINSGEN) and NAVSEA inspections, working group support for various programs ranging from the Defense Safety Oversight Committee to Fleet Operational Safety Council and multiple presentations and interactions, including Professional Development Symposium and Echelon II safety and occupational health groups.

Mishap Recommendations

One of NAVSAFECEN's 2021 Lines of Effort focused on improving its stewardship of mishap recommendations (MISREC) and HAZREP data.

- A major afloat safety initiative targeted improving internal and external communications to further develop synergy between afloat safety efforts and others within the NAVSAFECEN while also deepening our relationship with surface and subsurface TYCOMs and other external stakeholders. This initiative produced improved stewardship of all afloat MISRECs and better communication of our MISREC status resulting in an increased understanding of risks and appropriate mitigations by all stakeholders.
- Aviation Safety personnel reviewed and adjudicated about 3,100 FY21 mishap and HAZREPs, ensuring data standardization and accuracy, and tracked 1,557 MISREC and hazard recommendations for adjudication and implementation.
- Afloat Safety closed 110 Class A MISRECs.
- The aviation team also coordinated with Navy and Marine Corps aircraft controlling custodians to facilitate the completion of 704 recommendations during FY21 and continued its monthly oversight for the closure of proposed physiological events (PE) Root Cause Corrective Action recommendations. To date, 331 of 466, or 71%, of recommendations have been completed.

Safety Analytics Working Groups

Safety Analytics Working Groups serve as a collaborative forum of naval data analytics leaders to improve collaboration and de-conflict analytical work among all participants. The working groups support two of the NAVSAFECEN's core functions, Safety Risk Management and Safety Assurance, to provide data services that identify safety risk factors; promotes awareness of identified factors; and enables targeted risk mitigations and corrective actions by Navy and Marine Corps stakeholders.

- The Shore Safety Directorate coordinated and chaired several working groups including: RMI Functional Requirements and safety program management modules, Joint Services Safety Council's (JSSC) Motor Vehicle Working Group, JSSC Joint Tactical Vehicle, Navy PMV-2 High Velocity Outcome Task Force, Safety Quality Council Hearing Conservation, Navy Gas-Free Engineer Board, and NAVSEA fire reporting.
- Aviation Safety supported fleet Naval Air Training and Operating Procedures Standardization Conferences, System Safety Working Groups, Weapon System Explosives Safety Review Boards, Laser Safety Review Boards, and various other engagement opportunities both in-person and virtually.
- In partnership with the Joint Interagency FiveG Radar Altimeter Interference Working Group, Aviation Safety published ALSAFE 21/011, which highlighted 5G risks and associated actions required by naval aircrews.

Culture Workshop Assistance

The NAVSAFECEN is the program manager for the Culture Workshop (CW) Program, and conducts CWs during short-fused matters or assists with significant Navy concerns. The CWs give commanding officers a snapshot of their unit's culture. This snapshot is developed by trained facilitators who carefully listen to unit members. The workshops identify potential hazards that might interfere with mission accomplishment, and identify command strengths. Using the workshop findings, unit leaders can better focus on those areas requiring risk assessment and risk controls. The ultimate goal is operational excellence and developing positive behaviors that contribute to warfighting success. Expeditionary Warfare Directorate helped conduct CWs for the following commands:

- USS Gerald R. Ford (CVN 78)
- USS Dwight D. Eisenhower (CVN 69)
- Naval Station Norfolk Security Department, Virginia
- NAS Meridian, Mississippi
- NAS Corpus Christi, Texas

OSHA Special Government Employee Program Support

- OSHA Region 8's virtual inspection of Molson-Coors Grain Elevator
- Eight Voluntary Protection Program Annual Self-Evaluation Reports for OSHA Region 3

SAFETY PROMOTION

Guiding Principles

- We are responsible for providing world-class, safety-related training to the naval enterprise.
- We communicate with all levels of the naval enterprise for the greatest effect.

Training Initiatives

The Naval Safety Center (NAVSAFECEN) conducted several training initiatives in 2021, and below are a few highlights:

- The Shore Safety Directorate spearheaded NAVSAFECEN's third Line of Effort (LOE), Safety Professional Development, which assessed and developed safety professionals' competencies throughout the naval enterprise. This initiative focused on the knowledge and skillsets of safety advocates and professionals and redefined standards to better align education and qualification requirements to enhance support to the naval enterprise.
- The directorate established the Navy Safety Professional Certificate Program and Level 1 pilot course, which provides a tangible acknowledgement and worldwide recognition of the accomplishments of safety professionals.
- Additionally, the shore safety team hosted ISO 45001 training, which educated 15 NAVSAFECEN leaders on the gold standard for safety management systems.

This training will help better align the Navy with private industry and will supplement NAVSAFECEN's second LOE, Risk Management Rebranding.

- NAVSAFECEN's Naval School of Aviation Safety conducted 31 courses in 2021:
- Eight Aviation Safety Officer (ASO) courses resulting in 426 graduates.
- Eight Aviation Safety Commanders (ASC) courses resulting in 250 graduates.
- One Aviation Safety Manager (ASM) course resulting in 20 graduates.
- Fourteen Crew Resource Management Instructor (CRMI) courses resulting in 307 graduates.

Communicating Across the Naval Enterprise

The NAVSAFECEN produces a variety of targeted and data-driven reports and summaries for its customers and stakeholders, which are designed to promote safety as a core value with practices that support a sound culture of excellence. These products include training, awards, employee recognition, sharing best practices and lessons learned, promoting clear communications, and other actions to create a proactive safety climate and informed safety culture.

Our products are the result of collaborative efforts among all command directorates with multiple teams contributing to the overall content and development of each product and report.

The Knowledge Management and Safety Promotions (KMSP) Directorate has overall responsibility for providing advanced data analytics as well as in-depth studies, trends, data visualization and communication products to the naval enterprise to promote a culture of excellence across the Navy and Marine Corps.

Class A Mishap Executive Summaries

Class A Mishap Executive Summaries are brief synopses of safety investigationreports (SIRs) used to quickly and accurately inform customers of mishap causes and recommendations. These summaries are typically produced within 10 days of a Class A SIR release and then sent to applicable audiences via the directorate.

Case Studies

Command directorates conduct a variety of in-depth studies to address safety issues across the naval enterprise. Analysts collect, pull and analyze multiple data points and narratives to identify mishap trends. By combining this data with other contributing factors to include behavior, culture, environmental conditions, procedures and instructions, analysts can identify emerging risk trends and develop targeted recommendations to mitigate those risks. Case studies are published and disseminated to appropriate audiences.

- **Pedestrian mishaps for KMSP Shore Division Head:** This analysis was descriptive in nature, identifying causes of pedestrian mishaps for Navy personnel.
- **Class C air and Aviation Ground Mishap (AGM) modeling:** This ongoing effort models AGMs to explain the recent upward trend in this mishap category and whether personnel turnover or experience are contributing variables.

Case Studies, Cont.

- **Navy and Marine Corps Mishap Reporting Compliance:** The Knowledge Management Operations Research Division researched, wrote, and published four studies and provided support for several studies related to safety and performance with Naval Air Systems Command's High-Performance Division and Commander, Naval Air Forces' Data Analysis Division.
- **Carrier strike group (CSG) dashboard for Afloat:** Continued to further develop and fine-tune the dashboard display of CSG safety mishap statistics for use by type commander and CSG staffs.
- **Expeditionary strike group (ESG) dashboard for Afloat:** Continued to further develop and fine-tune the dashboard display of ESG safety mishap statistics for use by type commander and ESG staffs. This dashboard awaits completion while decision-makers determine ESG composition.
- **Motorcycle mishap analysis:** This effort examined whether motorcycle fatalities were more prevalent in the U.S. Navy and U.S. Marine Corps than in the general U.S. population. NAVSAFECEN analysts compared Navy and Marine Corps fatality rates with U.S. fatality rates, categorized by service, age group, and gender over the 2010-2019 time frame. Fatality counts from the Web-Enabled Safety System, U.S. Census, and National Transportation Safety Board data were used.
- **Quality control metrics for incoming data:** This analysis identified and recommended quality control processes and metrics for use on Risk Management Information Streamlined Incident Reporting (RMI SIR) data. The intent was to provide senior management with visibility on data quality as well as the value of NAVSAFECEN quality assurance processes and personnel.

KMSP Aviation completed 12 analytical studies in 2021.

- The Breaking Down of Technical Directive Screenings
- A-799 Correlation to Mishaps
- Sea versus Shore Crunch Mishaps
- PMV-2 Aviation Study
- Decline in Flight Hours
- Mishap Frequency using Exponential Distribution
- Maintainer Falls from Aircraft
- Near and Midair Collisions
- Manning Levels Contributing to AGMs in the MH-60S Community
- Differences in Types of AGM Occurrences During Day-Shift Hours
- Changes in AGMs between P-3 and P-8
- Air-Capable Ships Aviation Mishaps

Safety Promotions Division

Lessons Learned
The Lessons Learned Division actively collects, analyzes, publishes, and archives safety lesson learned information to include trends, analysis, and best practices. These products are disseminated via email and can be found on the Naval Safety Center website. Lessons Learned (LL) products communicate how to prevent future mishaps. The content and format vary, and they may be based on a single mishap or hazard, a series of incidents, a general mishap category, or an identified best practice. Titles are numbered by calendar year.

Throughout 2021, NAVSAFECEN produced 32 LLs covering topics such as winter sports, electrical mishaps, shipboard forklift mishaps, heat-related mishaps, and off-duty firearms mishaps.

Sanitized Safety Investigation Reports
Sanitized Safety Investigation Reports (SSIRs) are fully releasable Class A or B mishap safety reports that contain no personally identifiable information or information protected by safety privilege and can be disseminated to the fleet for training purposes.

In 2021, NAVSAFECEN released 17 SSIRs, including notable incidents such as a missile dropped during loading, aircraft nose gear retracting on deck, a shipboard hot work fire, and a formation flight midair collision.

For a full list of LLs and SSIRs produced in 2021, see Appendix E.

Media and Communications Division
The Media and Communications Division develops, produces, and disseminates a variety of communication products to further educate and inform NAVSAFECEN's internal and external stakeholders. The division also collaborates with all directorates in the development of safety promotion products tailored toward the needs of their specific warfighting communities.

- In 2021, the Safety Promotions Division published 23 articles, three issues of Approach magazine, two issues of MECH magazine, and one issue of the nascent Ground Warrior magazine supporting Marines Corps and naval expeditionary forces.
- The division reviewed and edited 41 studies and provided editing, layout and design, and editorial expertise for four Physiological Events Action Team newsletters, four Ship's Safety newsletters, four Factual Lines about Submarine Hazards newsletters, 39 aviation safety grams, two expeditionary safety grams, one Dataline newsletter, and 12 Rider Down monthly reports.

The team also produced three articles and associated infographics for the National Safety Council's Family Safety and Health magazine.

- To promote the NAVSAFECEN mission, the team produced three safety presentations, 24 videos, highlighting fall and winter safety, distracted walking and distracted driving, lessons learned, and mishaps to the internal NAVSAFECEN team and Sailors, Marines, and civilians across the naval enterprise.

The Safety Promotions team launched three major safety campaigns in 2021. Campaign products included messaging, training presentations, press releases, ALSAFEs, and a variety of multimedia products that were distributed via email, for download on the command website or via social media to ensure maximum reach to the naval enterprise. The eam developed more than 100 products for these campaigns.

Campaigns

"You're the Key to Motor Vehicle Safety" April 26 – Sept. 15, 2021. The campaign aimed to increase awareness on the top contributing factors to motor vehicle crashes, and inform Sailors and Marines on ways to reduce the likelihood and severity of motor vehicle mishaps through appropriate risk management strategies and best practices. Campaign topics emphasized the importance of preparedness, use of protective equipment and the dangers of distracted driving during use of private motor vehicles (PMV) as well as recreational motor vehicles to include off-road and all-terrain vehicles, motorized electric scooters and boats.

"101 Critical Days of Summer," May 28-Sept. 7. The "101 Critical Days of Summer" is an annual Navy and Marine Corps safety campaign intended to increase awareness of potential risks related to off-duty recreational activities, as well as other summer endeavors. The campaign launches at the start of Memorial Day weekend and runs through the end of Labor Day weekend. Mishaps, as well as associated deaths, have historically spiked during this time of year.

"Fall and Winter Safety," Oct. 15, 2021–March 15, 2022. "Fall and Winter Safety" is an annual Navy and Marine Corps safety awareness campaign intended to increase awareness of potential risks related to off-duty recreational activities, as well as other fall and winter endeavors. Private motor vehicle injuries and fatalities as well as mishaps from weather and seasonal-related activities typically spike during this timeframe and it is imperative to remain resilient and mitigate risks.

Media and Communication Awards
In March 2021, the division was recognized as the first-place winner in the Public Information category for the CY20 Thompson-Ravitz Awards for Excellence in Navy Public Affairs (PA) for its "RMI Reporting System SIR Roll-Out," strategic communication plan; and awarded second place in the CY20 Russell Egnor Navy Media Awards category for Graphic Designer of the Year.

Released ALSAFE Messages

The ALSAFE message system is a tool used to send information to the Navy and Marine Corps-wide audience on important policy changes, safety initiatives, and other key topics to preserve readiness and warfighting capabilities, and more importantly, save lives. The NAVSAFECEN disseminated nine ALSAFE messages in 2021. Of note and in partnership with the Joint Interagency-FiveG Radar Altimeter Interference Working Group, Aviation Safety developed ALSAFE 21-011, which guided 5G risks and associated actions required by naval aircrews. Below is a list of other 2021 ALSAFEs:

- ALSAFE 21-010 Chief of Naval Operations (CNO) Safety Awards Program
- ALSAFE 21-009 RMI SPM Inspections & Hazard Abatement Training Schedule
- ALSAFE 21-007 GEICO Military Service Awards Program
- ALSAFE 21-006 Establish 120-Day Extension of Motorcycle Rider Training Requirements
- ALSAFE 21-005 COMNAVSAFECEN Launches Motor Vehicle Safety Campaign
- ALSAFE 21-004 RMI SIR Training Schedule
- ALSAFE 21-003 FY2020 CNO Awards for Achievement in Safety Ashore
- ALSAFE 21-002 RMI SIR Training Schedule

Shore Safety Directorate

The Shore Safety Directorate provided several products contributing to safety promotion in 2021, including five occupational safety and health grams and eight ALSAFE messages. In addition to presenting "The Safety Case Model [System Approach to Risk Prioritization]" during the American Society of Safety Professionals annual safety conference in Austin, Texas, the directorate also provided the following briefs and presentations:

- Creating a Motorcycle Mentorship Program
- The Do's and Don'ts of Deficiency Writing
- Navy's safety functional community manager's claimant meeting to review proposed and current policy changes affecting safety professionals
- Three iterations of RMI SIR training
- Warfare Center community of practice brief
- TYCOM safety summit brief

Aviation Safety Directorate

The Aviation Safety Directorate contributed to safety promotion by participating in numerous engagements, including the Commander, Naval Air Forces – Atlantic podcast "All Things Naval Aviation," the Naval Air Station Lemoore/Naval Air Weapons Station China Lake Physiological Event Roadshow, Cope Fighter 21B, Hook '21's Safety Panel, the FA-18/EA-18G System Safety Working Group, PMA-202's In-Mask Sensor/Next Generation Mask Summit, and the U.S. Air Force PE Tech Days Summit.

Additionally, the directorate published 46 studies, Lessons Learned and SSIRs; eight Class A mishap executive summaries and ready room training briefs; 39 aviation community-specific quarterly safety grams and 23 articles in MECH and Approach magazines. The directorate also provided three maintenance risk management presentations, providing training to numerous aviation commands and personnel.

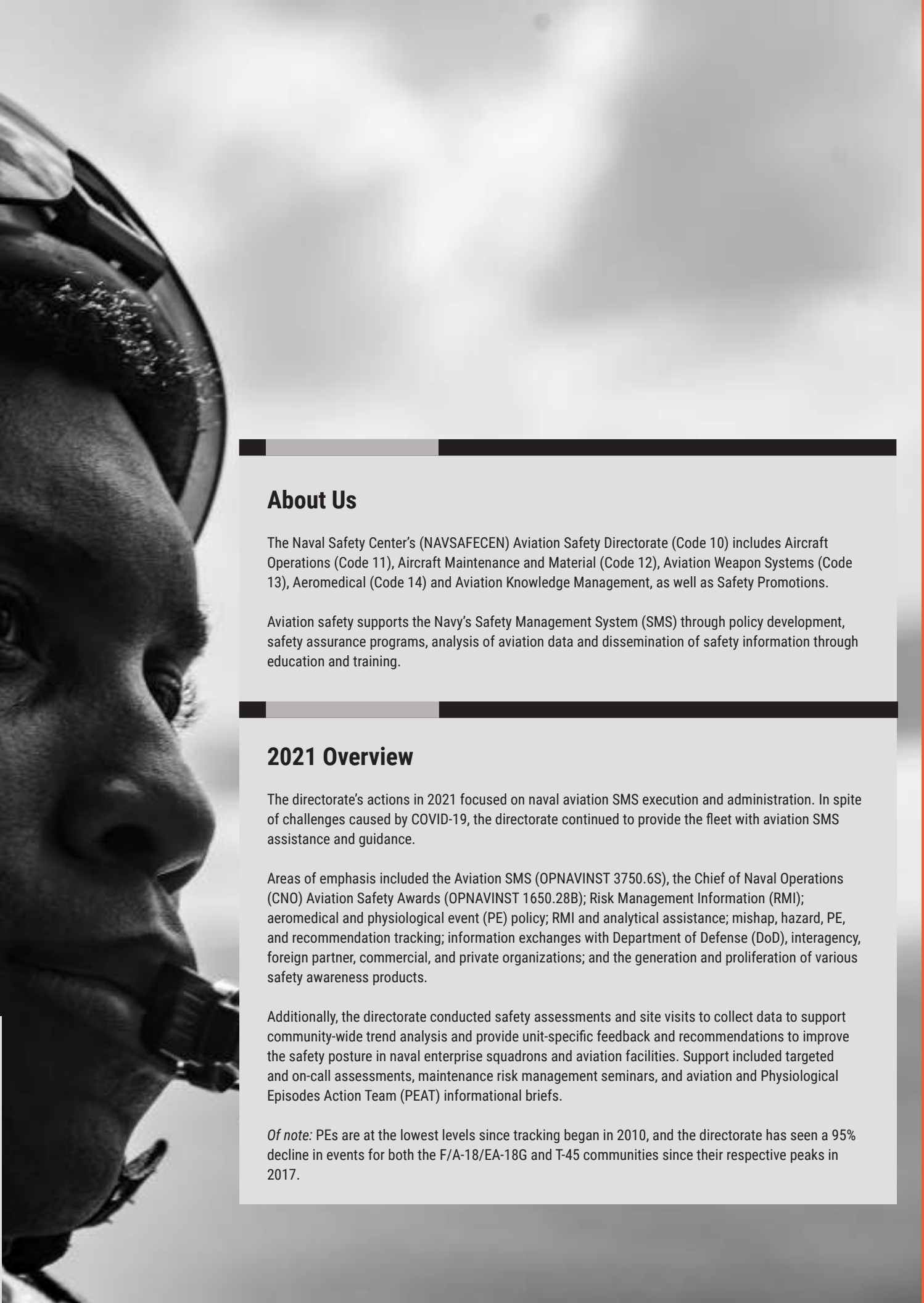
Expeditionary Warfare Directorate

The Expeditionary Warfare Directorate made a number of contributions to safety promotion, including the creation of six studies and analysis reports, the content for two editions of Drop Zone and Diving Safety Lines biannual newsletters, as well as six magazine articles. The directorate also provided 11 LLs and SSIRs in 2021.

APPENDICES

APPENDIX A: CODE 10

AVIATION SAFETY DIRECTORATE



About Us

The Naval Safety Center's (NAVSAFECEN) Aviation Safety Directorate (Code 10) includes Aircraft Operations (Code 11), Aircraft Maintenance and Material (Code 12), Aviation Weapon Systems (Code 13), Aeromedical (Code 14) and Aviation Knowledge Management, as well as Safety Promotions.

Aviation safety supports the Navy's Safety Management System (SMS) through policy development, safety assurance programs, analysis of aviation data and dissemination of safety information through education and training.

2021 Overview

The directorate's actions in 2021 focused on naval aviation SMS execution and administration. In spite of challenges caused by COVID-19, the directorate continued to provide the fleet with aviation SMS assistance and guidance.

Areas of emphasis included the Aviation SMS (OPNAVINST 3750.6S), the Chief of Naval Operations (CNO) Aviation Safety Awards (OPNAVINST 1650.28B); Risk Management Information (RMI); aeromedical and physiological event (PE) policy; RMI and analytical assistance; mishap, hazard, PE, and recommendation tracking; information exchanges with Department of Defense (DoD), interagency, foreign partner, commercial, and private organizations; and the generation and proliferation of various safety awareness products.

Additionally, the directorate conducted safety assessments and site visits to collect data to support community-wide trend analysis and provide unit-specific feedback and recommendations to improve the safety posture in naval enterprise squadrons and aviation facilities. Support included targeted and on-call assessments, maintenance risk management seminars, and aviation and Physiological Episodes Action Team (PEAT) informational briefs.

Of note: PEs are at the lowest levels since tracking began in 2010, and the directorate has seen a 95% decline in events for both the F/A-18/EA-18G and T-45 communities since their respective peaks in 2017.

SAFETY POLICY

- Aviation safety provided the naval enterprise daily formal and informal guidance regarding OPNAVINST 3750.6S, OPNAVINST 1650.28B, ordnance safety, aeromedical policy, and the RMI reporting system.
- As sitting members of various Naval Air Training and Operating Procedures Standardization (NATOPS) advisory groups, directorate subject matter experts, in coordination with Naval Air Systems Command (NAVAIR) and naval enterprise stakeholders, reviewed and endorsed 41 NATOPS manual changes affecting nearly every naval aircraft type/model/series as well as naval airfield operations and carrier-based operations.
- NAVSAFECEN is the Navy and Marine Corps authority on PE reporting and investigations policy, data aggregation and accuracy, event tracking, and PE information dissemination. To this end, the directorate continued updating the PE Operating Guide and relevant policy in 2021 to further improve a comprehensive process that standardizes the reporting and investigation of PEs across all applicable naval aviation platforms. The establishment of 2021's PE Quicklook proved to be extremely popular, efficient, and a major improvement to the reporting process.
- In early 2021, new F/A-18/EA-18G and T-45 NATOPS emergency procedures and verbiage were released to the fleet. The extensive PE update included robust additions to each aircraft system pertaining to the onboard oxygen generation system as well as completely revamped procedures for PE-related emergencies.
- As a permanent board member and safety advisor to the Weapon Systems Explosives Safety Review Board (WSESRB), the directorate represented the NAVSAFECEN during multiple WSESRB meetings. These meetings focused on the safety oversight process to acquire new and legacy upgrades of ordnance items, explosive components, and associated systems for use on naval aircraft, ships, submarines, and ground weapon systems.
- As a voting member in the monthly Laser Safety Review Board, NAVSAFECEN provided valuable recommendations to the board focusing on the procurement, operations, and maintenance for laser systems. Specifically, directorate representatives reviewed Class 3B and 4 lasers used in optical fiber communications systems, all Department of the Navy (DON) lasers used in combat, combat training, or classified in the interest of national security, and all laser systems capable of exceeding Class 3R levels.
- The directorate influenced multiple instruction and policy updates, including two Commander, Naval Air Forces (COMNAVAIRFOR) 4790.2D Naval Aviation Maintenance Program Standard Operating Procedure updates, one COMNAVAIRFOR 5100.5 Naval Air Forces Safety Management System update, and the NAVAIR 00-80T-123 Aircrew Systems NATOPS Manual.
- To assist the fleet in RMI reporting and standardization, directorate staff wrote an RMI Quality Control Guide and an RMI Operating Guide addressing report generation, challenges, frequently asked questions, and provided NAVSAFECEN personnel a standardized methodology to review RMI reports.
- Directorate analysts participated in 14 System Safety Working Groups (SSWGs) for various aircraft types, providing NAVAIR and naval enterprise stakeholders with mishap and hazard data for evaluation and mitigation through technical and procedural solutions.
- The team developed and coordinated 93 reciprocal information-sharing agreements with DoD, non-DoD governmental, academic, and commercial partners to enhance analytical support for naval platforms and procedures. Worked hand in hand with U.S. Coast Guard and DoD partners to share common platform information to increase safety awareness and collaboration across the services.

SAFETY RISK MANAGEMENT

- The directorate provided aircraft, maintenance, ordnance, and aeromedical subject matter expertise and analysis to the naval aviation enterprise (NAE), Office of Legislative Affairs, and fleet as a whole. This includes providing real-time assistance and training, analysis, and product generation.
- During FY21, the directorate worked with naval constituents to enhance safety reporting via the RMI program of record. Though the system was introduced the year prior, this year saw continued efforts to refine the system. Directorate personnel supported NAVSAFECEN efforts to provide guidance and train members of the enterprise. The team supported Trident Warrior 21 to ascertain the employability of RMI from underway platforms to validate challenges using the system while embarked. Additionally, directorate personnel created dozens of RMI feedbacks to correct errors and enhance system effectiveness.
- The directorate participated in a joint Commander Naval Air Forces (CNAF), CNA, NAVSAFECEN Performance to Plan effort to continue to attack aviation ground mishaps (AGMs) within the NAE. The joint team focused on shipboard aircraft move and taxi mishaps, and as a result of advanced analytics, determined the aircraft director and tow tractor operator experience, or lack of, highly correlated with shipboard AGM mishaps.
- The directorate coordinated with Headquarters U.S. Air Force's Operations Directorate (A3) and NAVAIR's PMA-202 (Aircrew Systems) to produce Aircrew System Advisory 21-08, which provided data to mitigate a manufacturing defect on aircrew gunners' belts. Due to the seriousness of the defect, if left uncorrected, the affected gunners' belts could have led to fatal mishaps.

- Along with the Aviation Squadron Safety Assessments, the directorate conducted Aviation Maintenance Risk Management seminars and spoke at Aviation Maintenance Officer, Aviation Safety Officer, Aviation Safety Command, Aviation Ordnance Manager Career Progression, and Naval Aerospace Medical Institute's Aeromedical Officer Courses.
- The directorate coordinated with CNAF and Headquarters Marine Corps to address a training gap in Marine Corps aviation identified during safety assessments. Unlike the Navy, the Marine Corps does not have a military occupational specialty equivalent to the aviation structural mechanic – safety equipment rating, but relies on their aviation life support system (ALSS) Marines to cover those requirements. The result is that ALSS Marines are maintaining gear but have not attended the requisite "C" school as required by the new COMNAVAIRFORINST 4790.2D. This issue is being rectified by the services.
- The directorate synthesized assessment data, Naval Ordnance Safety and Security Activity (NOSSA) Explosives Safety Inspections/Shipboard Explosives safety inspections data, and RMI hazard and mishap data to improve the weapons safety awareness of fleet operational units and activities. This included in-person support to two NAVSAFECEN-NOSSA mishap training seminars that ensured alignment between NOSSA and the 5102 and 3750 reporting requirements.
- In conjunction with NAVSAFECEN's Expeditionary Warfare Directorate, the Aviation Safety Directorate supported culture workshops for USS Dwight D. Eisenhower's (CVN 69) Air Department and Naval Station (NS) Norfolk , Virginia, security staff.
- After learning runways at NS Norfolk were not going to be grooved per best practices due to a delay in runway completion, the directorate provided the airfield manager and the station commander data to clearly articulate the risks. After reviewing the provided data, the airfield manager and station commander decided the two-week delay for grooving the runway was insignificant compared to the risk of failing to do so, changing their decision to groove the runway.

SAFETY ASSURANCE

- Despite the COVID-19 environment, NAVSAFECEN performed 37 Aviation Squadron Safety Assessments and 11 Air Station and Aviation Facility Safety Assessments. These assessments provided a comprehensive look at how units operated, communicated, and used risk management during planning and execution. Using process observation and programmatic measures, these teams, comprised of Navy and Marine Corps subject matter experts, provided actionable recommendations to unit commanders and identified systemic risks facing the aviation community to higher echelons of command.
- In coordination with CNAF, the directorate led a comprehensive evaluation of the Chief of Naval Air Training (CNATRA), which included Echelon II-V site visits, detailed analytics, and culture assessments. The final report was generated by the aviation safety programs director and provided to the CNAF for review and action.
- Directorate personnel reviewed and adjudicated approximately 3,100 FY21 mishap and hazard reports, ensuring data standardization and accuracy.
- Code 10 tracked 1,557 mishap and hazard recommendations for adjudication and implementation, and coordinated with Navy and Marine Corps aircraft controlling custodians to facilitate the completion of 704 recommendations during the fiscal year.
- The directorate continued its monthly oversight for the closure of proposed PE Root Cause Corrective Action recommendations. To date, 331 of 466, or 71%, of recommendations have been completed.

SAFETY PROMOTION

- Working with the Joint Interagency-FiveG Radar Altimeter Interference Working Group, the directorate developed ALSAFE 21/011, which provided guidance regarding 5G risks and associated actions required by naval aircrews. The directorate will continue to work with NAVAIR, CNAF, and other stakeholders to monitor and analyze risks to naval aviation.
- To continue constant communication with PE stakeholders, the team participated in numerous engagements throughout 2021. These included:
  - CNAL's "All Things Naval Aviation" podcasts
  - Naval Air Station Lemoore and Naval Air Weapons Station China Lake, California, PE Roadshow
  - Cope Fighter 21B
  - Hook '21 Safety Panel
  - A-18/EA-18G SSWG
  - PMA-202's In-Mask Sensor and Next Generation Mask Summit
  - U.S. Air Force PE Tech Days Summit

SAFETY PROMOTION, Cont.

- The PEAT released nine newsletters and three Armed Forces Network infomercials, consistently updating the fleet on the latest information pertaining to the PE effort.
- Code 10 reviewed, coordinated, and provided 71 safety awards on behalf of the CNO. Safety awards included 64 CNO Aviation Safety Awards presented to individual squadrons, four Admiral Flatley Memorial Awards for CVN and L-class ships and their embarked carrier air wings or Marine Air-Ground Task Forces, two Grampaw Pettibone Awards for the organization and individual who contributed the most toward aviation safety awareness through publications and media resources, and one CNO Readiness Through Safety Award to the aircraft controlling custodian who had the lowest mishap rate across the NAE.
- Code 10 assisted CNAF's development of the 2022 Safety Campaign Plan and actively supported its execution with aviation safety-focused messages and scenarios to increase fleet situational awareness and risk management efforts.
- Along with providing daily analysis support to the naval enterprise, the directorate published 46 studies, lessons learned (LL) and sanitized safety investigation reports (SSIRs); eight Class A mishap executive summaries and ready room training briefs; 32 aviation community-specific quarterly safety grams and 23 stories in MECH and *Approach* magazines.
  - Class A mishap executive summaries and ready room training briefs are privileged products that respectively summarize safety investigation reports (SIR) to quickly and accurately inform the aircraft controlling custodians and squadron personnel of mishap causes and recommendations. These products are generally produced within 10 days of the release of a Class A SIR and pushed by the directorate to the applicable audience. These are available upon request to safety officers at all levels of command.
  - Quarterly safety grams are non-privileged products that provide a quarterly roll up of mishap and hazard information, as well as policy, training and trend information. These products are designed for and pushed to squadron safety officers, but are available upon request.


4

FY21 AVIATION MISHAP TREND SUMMARIES

2021 Navy and Marine Corps Mishap Overview

In FY21, naval aviation saw an overall rise in the number of mishaps. Class A events rose slightly from 14 events in FY20 to 15 events in FY21, while Class B mishaps jumped significantly from 27 to 40. Rising component cost when compared to the threshold for Class B mishaps may have played a part in the continued rise of Class B reporting.

*** Note:** *This analysis was conducted using data collected in late 2021. Some mishap events may have changed classification since the writing of this report.*

Figure 1. USN Class A-D Mishaps

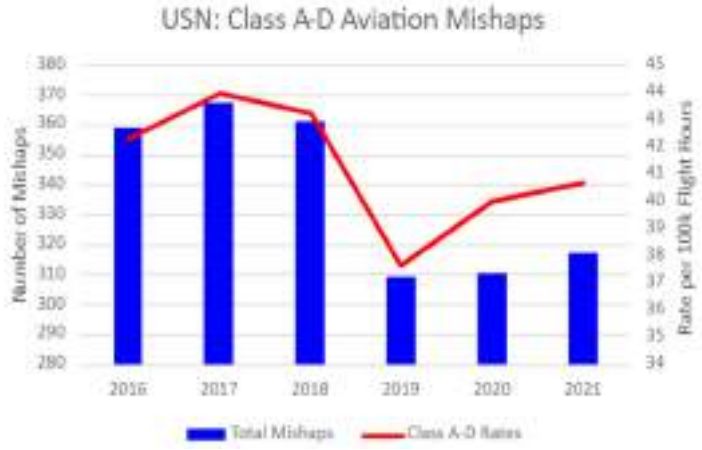
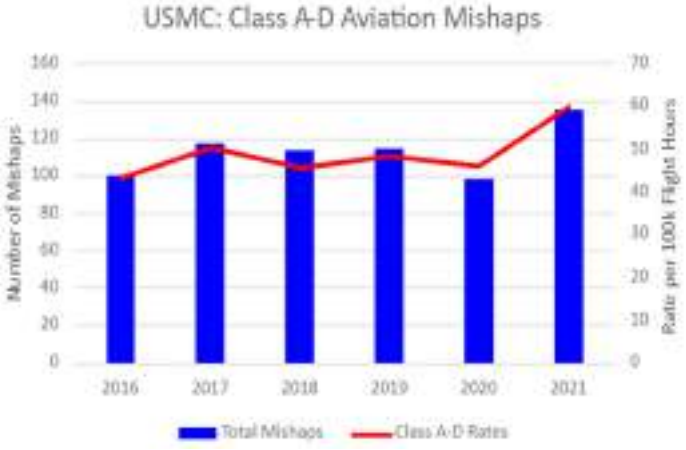


Figure 2. USMC Class A-D Mishaps



Navy FY21 Class A and B Mishaps

U.S. naval aviation has shown a steady rise in both the number and rate of events per 100,000 flight hours since a significant drop in FY19. While these remain notably lower than previous averages, the marked rise in rate of mishaps per flight hour is concerning. Class A events have continued to rise steadily to the highest number in the past five years, while Class B events have almost reached levels on par with the spike in 2018.

Figure 3. USN Class A Aviation Mishaps

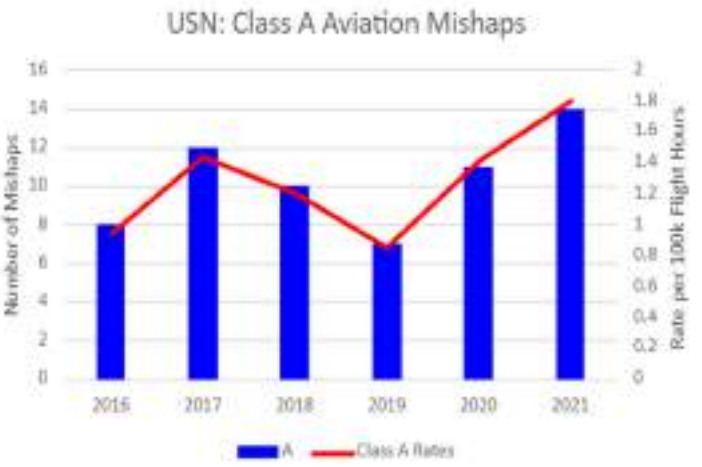
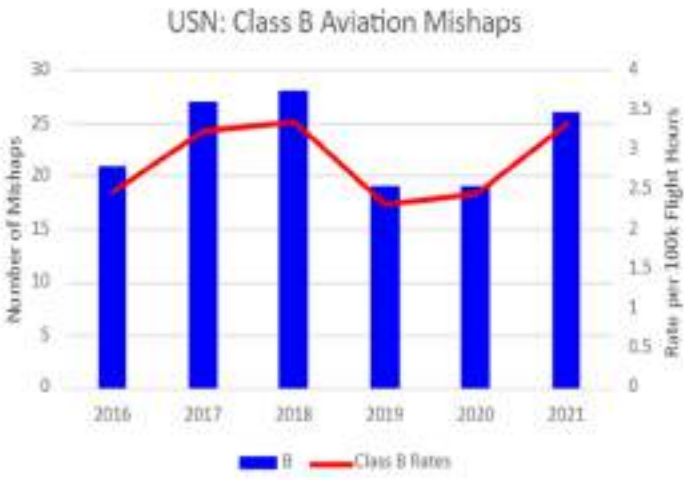


Figure 4. USN Class B Aviation Mishaps



FY21 AVIATION MISHAP TREND SUMMARIES

Marine Corps FY21 Class A and B Mishaps

While there was a slight overall rise in the number and rate of mishaps within Marine Corps aviation, there were no Class A flight mishaps in FY21. This is the first time this has occurred since naval aviation began recording aviation mishaps. The Marine Corps aviation community should celebrate this achievement and continue striving for safe and effective flight operations. A single ground Class A event was the only event to cross that threshold in FY21. Marine Corps Class B events rose from the previous year to match a spike from 2019, more than doubling numbers seen five years ago, although about a third of the Class B mishaps were related to the RQ-21 Blackjack unmanned aircraft system (UAS).

Figure 5. USMC Class A Aviation Mishaps

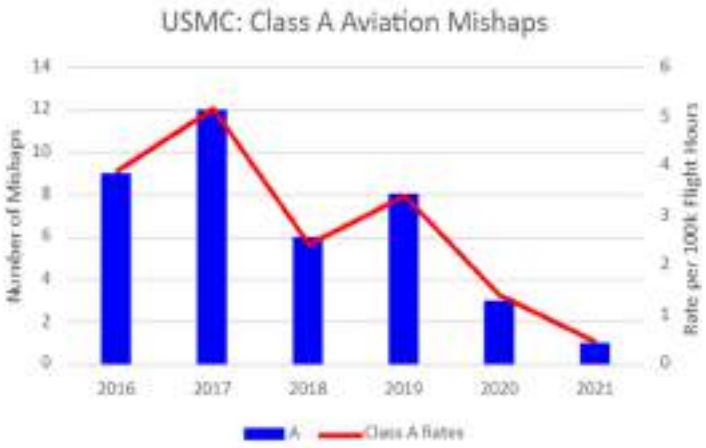
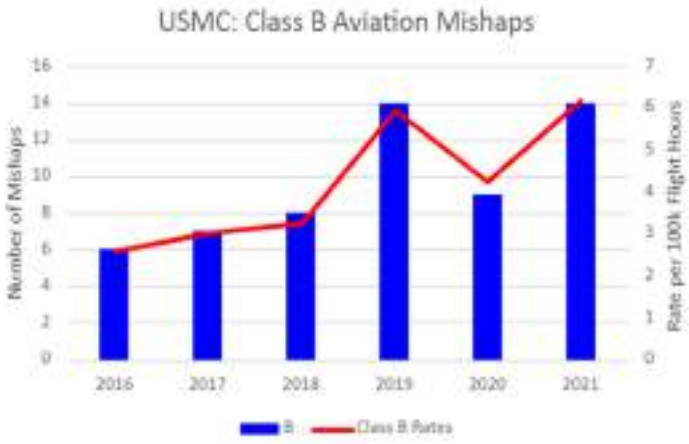


Figure 6. USMC Class B Aviation Mishaps



Navy Class A Flight Mishaps

T-45C crashed on final approach into Joint Reserve Base Fort Worth, Texas. Both aircrew ejected successfully with non-life-threatening injuries.

- After landing on ship, aircraft slid off the deck into the water with six personnel aboard. One crewmember rescued, five lost at sea.
- TH-57 crashed while conducting contact maneuvers. Aircrew incurred injuries, but no fatalities.
- MH-60S crashed while conducting search and rescue mission for lost hiker in the Inyo National Forest, California; no injuries.
- F/A-18F sustained foreign object debris (FOD) damage to starboard intake and starboard engine due to bird strike during low-level. Aircraft recovered safely with no injuries.
- Two T-45Cs collided during a formation flight. Two successful ejections from one aircraft, the other aircraft safely landed at Naval Air Station Kingsville, Texas, with no injuries.
- T-45C crashed after departing the landing pattern. Both crewmembers ejected safely; however, aircraft was destroyed.
- F/A-18F struck a bird while conducting a low-level flight. Aircraft safety returned to base with no injuries.
- T-6B crashed during training mission; both aircrew deceased.
- F/A-18E crashed after experiencing in-flight emergency; pilot ejected safely.

Navy UAS Class A Mishaps

- MQ-8B crashed after departing perch underway; no injuries. (Flight)
- MQ-8C was damaged during high-power maintenance ground turn at Naval Outlying Field Webster, Maryland. (AGM)
- MQ-8C crashed during functional check flight; no injuries. (Flight)

Navy Aviation Ground Class A Mishap

- Multiple MH-60R helicopters damaged by Aqueous Film-Forming Foam (AFFF) when system discharged in hangar; no injuries.

FY21 AVIATION MISHAP TREND SUMMARIES

Marine Corps Class A Flight Mishaps
No flight mishaps in FY21.

Marine Corps Aviation Ground Class A Mishaps
F-35C incurred FOD to engine during startup.

Navy and Marine Corps Class C Mishaps
While there was a general downward trend in Navy Class C events and an uptick in Marine Corps Class C events, the total number of Class C events was nearly identical to the previous year with 216 in FY21 and 208 in FY20.

In FY20, there were 148 Navy Class C mishaps, a solid decrease from FY20.
1. 81 AGMs (Prominent airframes: 46x E/A,F/A – 18 variant, 15x H-60)
2. 61 Flight Mishaps (FM) (Prominent airframes: 26x E/A,F/A-18 variant, 11x H-60)
3. 6 Flight-Related Mishaps (FRM)

In FY21, there were 68 Marine Corps Class C mishaps, an increase of 31% from FY20.
25 AGMs (Prominent airframes: 10x F-35, 7x MV-22)
37 FMs (Prominent airframes: 8x MV-22, 5x AH-1Z)
6 FRMs

As in FY20, the majority of FY21 Class C AGMs were due to performance-based errors that occurred during ground maintenance operations. Aircraft move evolutions, where an aircraft impacts an object, injuries during maintenance, falls from aircraft or equipment, and damage to equipment during maintenance are examples of these errors. FY21 Class C flight mishaps were primarily characterized by things falling off aircraft (TFOA), bird/wildlife aircraft strike hazards (BASH), and FOD from unsecured panels.

Figure 7. USN Class C Aviation Mishaps

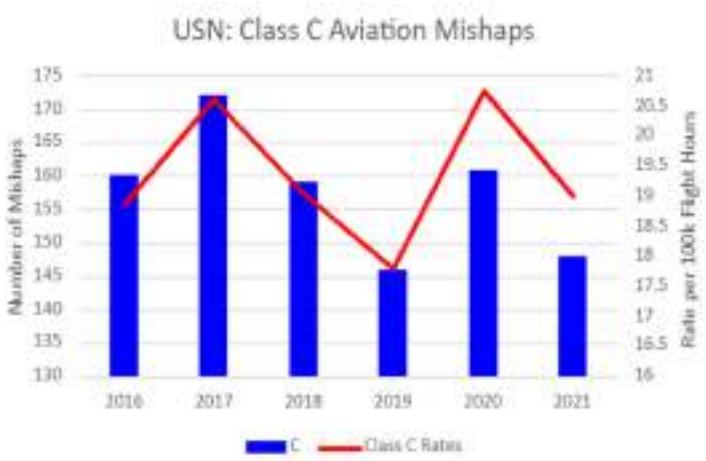
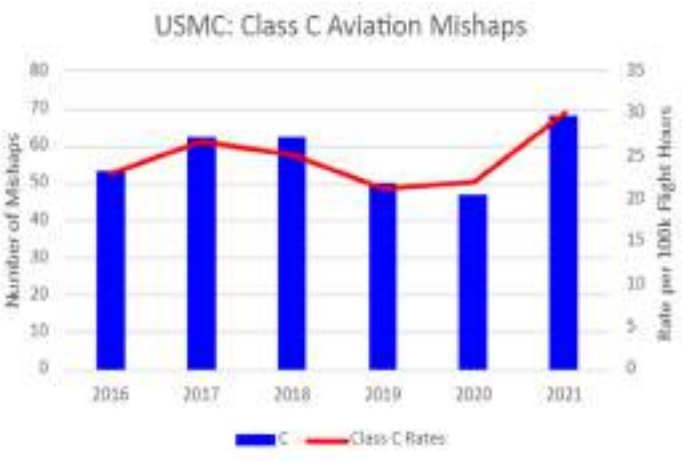


Figure 8. USMC Class C Aviation Mishaps



FY21 TRENDS IN SQUADRON AND UNIT AVIATION SAFETY ASSESSMENTS

Maintenance Department Observations

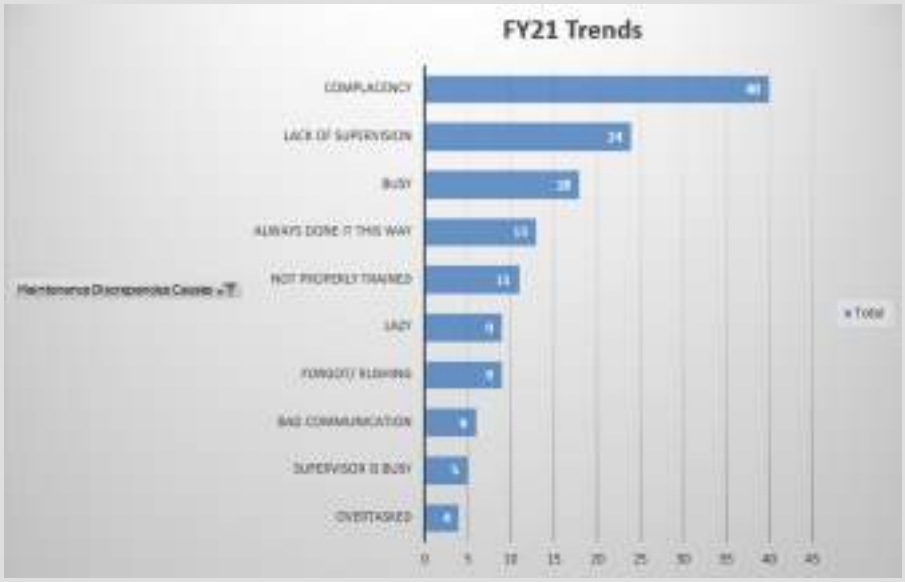
There were reoccurring negative discrepancy trends observed during FY21 aviation maintenance assessments. These were a repeat of FY20's top negative trends within naval aviation maintenance. When compared with FY21 aviation maintenance mishap top causal factors, there was a direct correlation.

FY21 TRENDS IN SQUADRON AND UNIT AVIATION SAFETY ASSESSMENTS

The top negative trends observed during FY21 aviation assessments were:
Procedural non-compliance during routine maintenance evolutions.
Complacency and a lack of proper training, lack of supervision or the wrong level of supervision present during maintenance evolutions, personnel performing maintenance without required publications and failure to review the Non-Aeronautical Equipment Report.
Lack of manpower training and equipment: Squadrons lacked the correct fill of experienced personnel to properly train; availability of parts when required; availability of required support equipment and the sufficient availability of authorized hazardous materials.
These trends often resulted in observation of maintenance evolutions not supervised at all or supervised by inadequately experienced people, maintenance or inspection instructions were not present during tasks and personnel performing maintenance who were not qualified or certified for the task assigned. There is a difference between qualified and proficient, but aviation units and leadership often use the two terms interchangeably, which can increase risks.
Failure to perform a proper real-time risk assessment: Risks or hazards not identified, lack of situational awareness, lack of or improper use of personal protective equipment, and lack of proper training were among the common reasons cited in mishap reports.

Figure 9. FY21 Aviation Maintenance Safety Assessment Discrepancy Trends

Figure 10. Aviation Maintenance Safety Assessment Discrepancy Causes



FY21 TRENDS IN SQUADRON AND UNIT AVIATION SAFETY ASSESSMENTS

Safety Department Observations

Many of the issues referenced in previous NAVSAFECEN annual reports remain relevant in FY21. In the VFA and VAQ communities, officer manning pressures still require personnel to fulfill roles with potentially competing interests, which can present a conflict of interest from a safety perspective. Some squadrons are lacking an SMS instruction or an updated safety policy signed and posted by the commanding officer — especially following a change of command. Many units are not using the maintenance Aviation Safety Awareness Program (ASAP) to its fullest potential; using ASAP can help inform the enlisted safety committee. Maintaining motorcycle safety qualifications has proven difficult because of training resource availability due to COVID-19 restrictions. A best practice employed by many units is to create and post QR codes around the spaces so Sailors and Marines can access the ASAP and submit an 'anymouse" report from their mobile devices. There were many productive conversations with aviation safety officers and safety department personnel about RMI usage, and overall proficiency continues to improve across the NAE.

Operations Department Observations

As with other areas of observation, many operations department observations from previous years still resonated in FY21. Navy units in the maintenance phase continued to experience pressure from their chains of command to conduct maintenance and train aviators; however, they lacked the adequate resourcing they would normally have in another phase. Some communities, especially the strike fighter community, continued to face challenges in pilot manning. These units have drastically fewer pilots than required, according to their manning document, increasing the challenge to all pilots assigned to that unit to meet proficiency and non-flying requirements.

A best practice observed at some units was a codified set of business rules between maintenance and operations that allowed the maintenance team to more effectively plan in advance, resulting in increased opportunity to provide ready-for-tasking aircraft. Deck landing qualification and ship availability for landing evolutions continued to be a limitation for many units, specifically in the rotary-wing community. ALSS gear turnaround delays at the fleet readiness center level continued to be a problem affecting the entire tactical air (TACAIR) and VAW community. As mentioned in years past, a best practice for all aviation units being employed by Marine Corps squadrons was requiring a safety representative to review the flight schedule before obtaining the commanding officer's signature.

Communication Observations

Communication within squadrons continued to remain a challenge, which was exacerbated with the implementation of COVID-19 restrictions. Some units appeared to communicate very well, while others seemed to have greater difficulty, although no community-specific communication trends were identified.

The most commonly observed challenge was that communication tended to be very good at the department head level and above, but the information was not disseminated to junior officers, Sailors, and Marines. A best practice employed by some units was to make a consolidated operations and maintenance calendar available to all hands via email, Teams, or the squadron's shared drive that identified upcoming squadron events and milestones. Units that cannot electronically post information due to classification restrictions have demonstrated success posting and disseminating paper calendars within squadron spaces.

FY21 OVERVIEW OF AVIATION FACILITY ASSESSMENT OUTCOMES

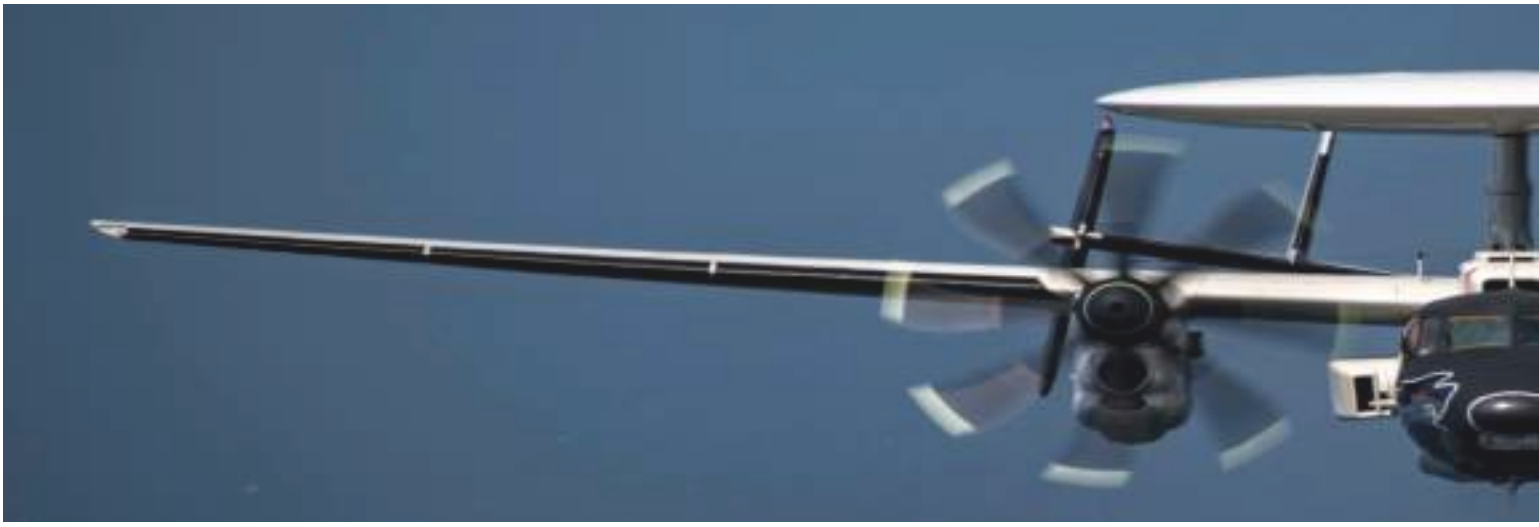
The NAVSAFECEN conducted 11 facility safety assessments in FY21. Many challenges identified in previous years remained in FY21. The teams continued to observe fleet aviation units that routinely work in deteriorating hangars without systems required to conduct day-to day operations. This included air traffic control facilities such as control towers which also have suffered years of neglected maintenance.

The general habitability of hangars continues to be a common concern around the fleet, with quality of life and safety concerns that affect unit readiness, morale, and safety posture. Examples of common habitability deficiencies include leaking roofs and windows, insulation falling from ceilings, missing ceiling tiles, failed plumbing, and mold. Far more egregious issues such as inoperable pressurized air systems, hangar doors, and AFFF suppression systems decrease productivity and increase risk to personnel and equipment.

Airfields lack proper funding to maintain fencing, runways, and taxiways. The Aircraft Rescue Fire Fighting teams do not always possess the proper equipment required to safely combat fires, conduct rescues, or overhaul an aircraft during an emergency or fire. The E-28 arresting gear is degraded and it is extremely challenging to get extra parts for maintenance. Control towers assessed lack funds for maintaining original systems. Several had no water coming from the fountains or sinks. Carpeting in most towers is old and deteriorated to the point that it presents tripping hazards. Outlying airfield towers are in poor shape, to include cloudy windows and a lack of tower workstation displays to aid in separating aircraft.

Other common problems on airfields included mowers lacking proper airfield markings, vehicles not reading back hold short instructions, and controllers short-keying their transmissions. Airfield movement violations continued to be a problem throughout the fleet, even at well-managed airfields. Most airfields lacked funds for basic upkeep like rubber removal, seam repair, and paint. Total runway replacement and fencing were other areas of concern where funds were sporadic. Most aircraft, vehicle, and air traffic control hazard reports were unreported in RMI. The accuracy of the data is lacking due to significant underreporting of events.

These facility concerns have been noted for years and tenant commands often feel helpless to correct them. Sailors and Marines, undeterred and resourceful in accomplishing their missions, find inventive ways to work around these enduring and hazardous facility issues. Despite their well-intentioned efforts, in many cases, the workarounds violated safety policy and placed maintainers, aircrew, and aircraft in unmitigated and unnecessary risk situations outside of existing established procedural guidance.



FY21 AVIATION ANALYSIS BY COMMUNITY

E-2C/D Hawkeye / C-2A Greyhound

After showing an increase in mishap rates in all mishap classes except Class D in FY20, the E-2/C-2 communities recovered in FY21 to show a decreased mishap rate for each mishap class. Class C mishaps showed the highest mishap rate in the E-2/C-2 communities.

There was a drastic reduction in mishaps compared to previous years within the E-2/C-2 communities, with five mishaps for FY21. After showing a five-year high in Class A mishaps in FY20, the E-2/C-2 communities improved to zero Class A mishaps in FY21.

The E-2/C-2 communities reduced Class B mishaps in FY21, showing zero mishaps in this category.

Class C mishaps accounted for 80% of the mishaps reported in the E-2/C-2 communities during FY21 with four mishaps. Three were AGMs, and the final mishap was due to a segment of fixed wire antenna getting ingested into the engine.

The E-2/C-2 communities have reduced Class D mishaps in FY21, showing one mishap in this category. This mishap occurred due to damage to multiple hydraulic lines during maintenance.

Figure 11. Combined Class A-D Aviation Mishap Rates

Figure 12. Class A-D Aviation Mishaps

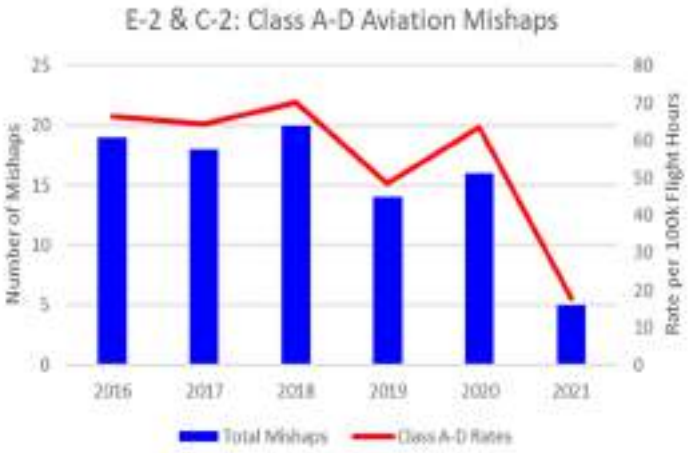


Figure 13. Class A Aviation Mishaps

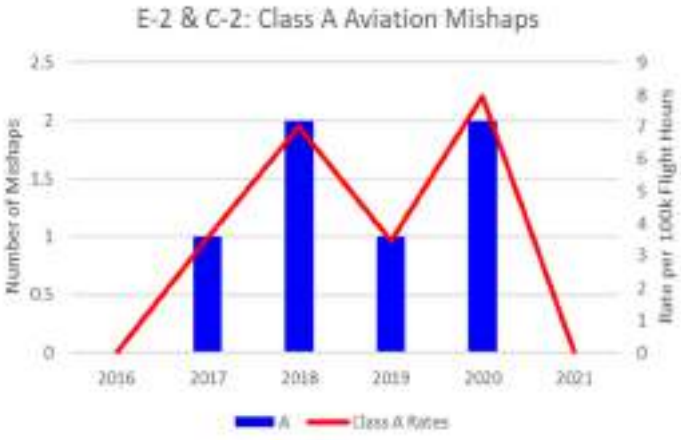


Figure 14. Class B Aviation Mishaps

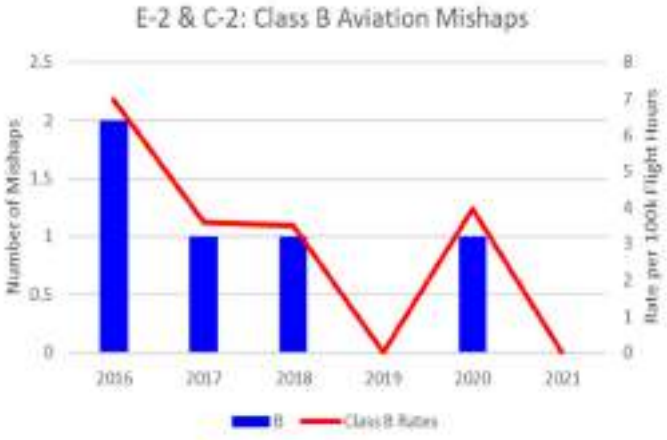


Figure 15. Class C Aviation Mishaps

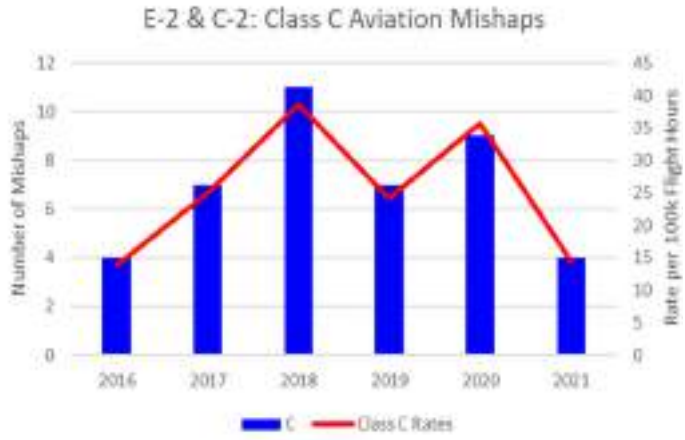
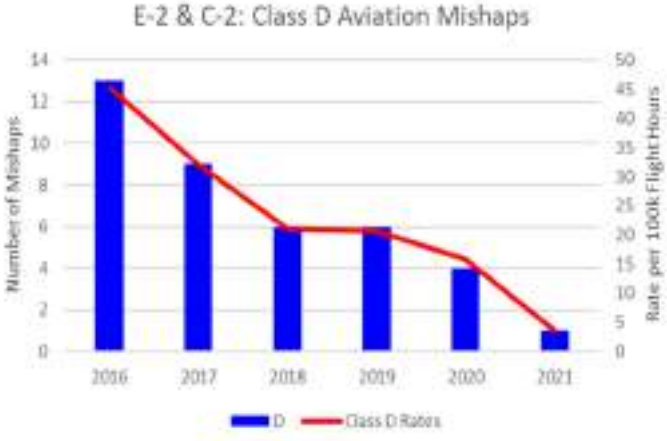


Figure 16. Class D Aviation Mishaps



C/KC-130 Hercules and C-40 Skytrain (VR/VMGR)

The Navy and Marine Corps C/KC-130s and C-40s that comprise the big-wing cargo community remained at a steady rate of mishaps for FY21. The increase in mishaps since FY19 correlated with the increase in flight hours flown since FY18-19 but was above the average for previous years in which similar flight hours were flown. The combined Class A-D mishap rate saw a 50% increase over the past two fiscal years with over 50% of the contributing mishaps being a Class C or above. C-40 mishaps continued to remain low with only one Class C mishap for FY21.

Air-to-air refueling operations were the major source of Class A mishaps in previous years, but procedures and publications have been updated to incorporate more controls to mitigate risk. FY21 did not see a Class A, but experienced a Class B AGM involving cargo loading procedures. All other FY21 big-wing cargo community mishaps were Class C or Class D events.

Class C mishap rates have spiked the last two years, more than doubling the mishap rate after being on a steady downward trend since FY16. FY20-21 Class C mishaps were predominantly AGMs involving maintenance. Bird strikes only accounted for two of the combined 15 reports for FY21 Class C and D mishaps.

FY21 Class D mishaps rose slightly from the previous year. Four out of the seven mishaps were AGMs consistent with the trend of lower-level mishaps being maintenance related.

Based on C/KC-130 and C-40 mishap and hazard reporting, the leading causal HFAC preconditions were as follows:

- A breakdown in teamwork
- Critical information not communicated
- Failure to effectively communicate
- Failure of crew/team leadership
- State of mind
- Complacency
- Not paying attention

Of note, the most predominant HFAC in Class A and B mishaps for C/KC-130 operations were cited as “Procedure not followed correctly,” which aligned with previously identified preconditions. This HFAC was cited in five out of the eight Class A and B mishaps.
Of the 25 Class E events, BASH and TFOA made up over half. Cargo- and passenger-related hazards and taxi mishaps were the next two significant source of Class E mishaps.

The big-wing cargo community has a healthy hazard reporting culture. In FY21, C-40s reported 18 HAZREPs, 14 of which were BASH, two lasing incidents, one passenger/cargo issue, and one air traffic control-related hazard. Navy and Marine Corps C/KC-130 squadrons reported 62 HAZREPs, 15 of which were BASH related. Just under half of all C/KC-130 HAZREPs were BASH related.

Another 14 reports were maintenance malfunctions which may be related to last year’s identified trend of depot-level and intermediate-level maintenance aircraft maintenance errors. Many of these C/KC-130 discrepancies were found months, even years, after the aircraft was accepted as “safe for flight.” Most were discovered during unrelated maintenance at operational squadrons or as flight handling observations made by aircrew during flight, and many could have resulted in catastrophic materiel failure. Another trend observed was cargo- or passenger-related hazards which was the third-highest trend among reports and corresponded with Class E reporting.

Figure 17. Class A-D Aviation Mishaps

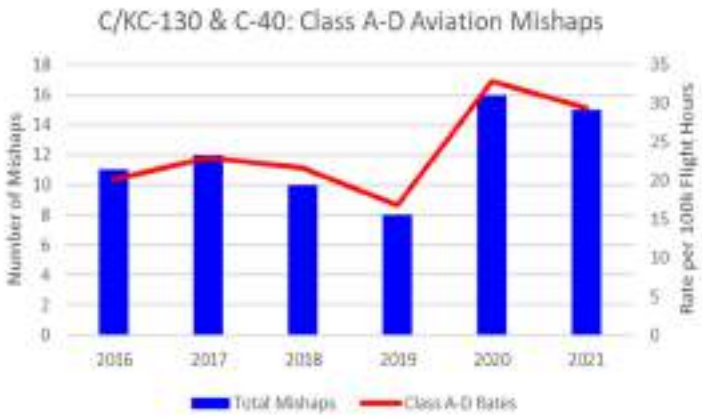


Figure 18. Class A Aviation Mishaps

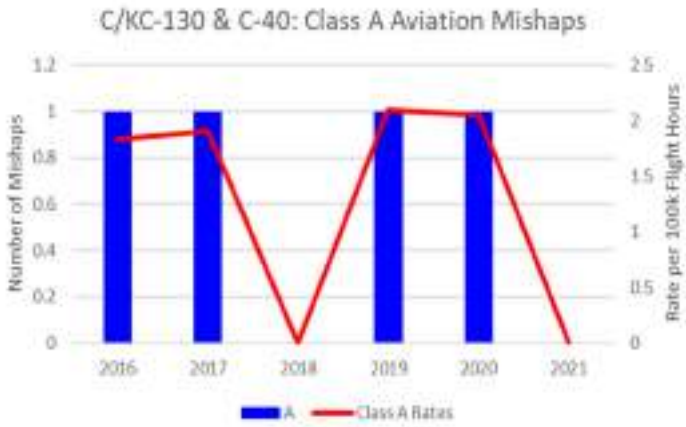


Figure 19. Class B Aviation Mishaps

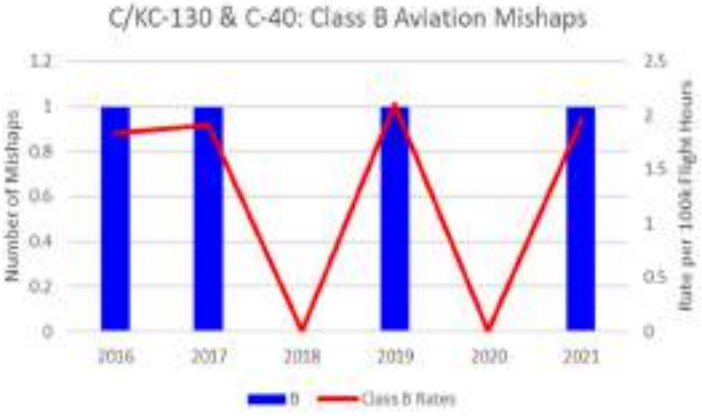


Figure 20. Class C. Aviation Mishaps

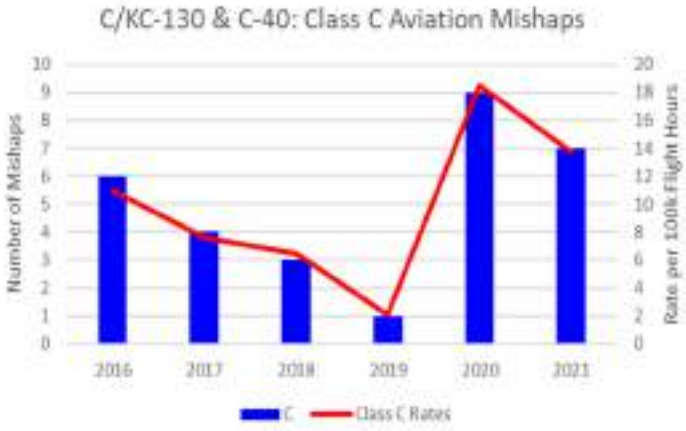


Figure 21. Class D Aviation Mishaps

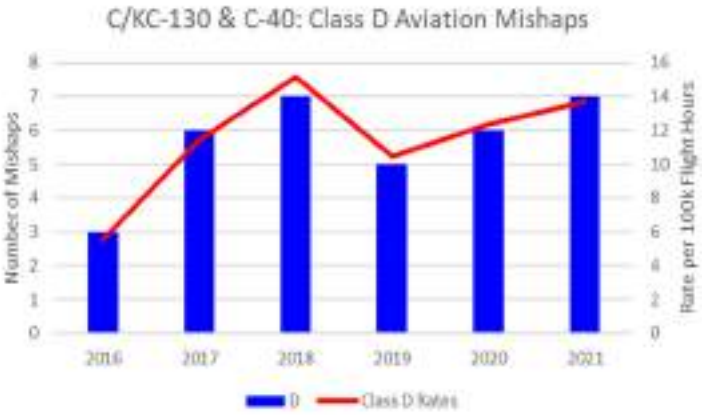
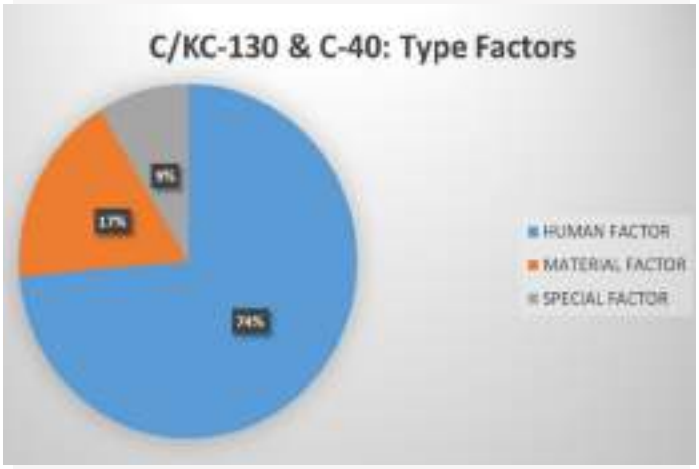


Figure 22. Type Factors



TACAMO (E-6B Mercury)

Overall, the E-6 community saw a significant increase in the number of mishaps in FY21. There were no Class A or Class B mishaps, and a reduction in the number of Class C mishaps. Class D rates increased significantly, mainly attributed to TFOAs and personnel injuries. Of the two Class C mishaps, both were ground events that occurred during maintenance evolutions. One was an inadvertent cutting of the short wire during maintenance, and the other was damage to an elevator during its removal.

There were nine reported Class D mishaps, which is a large increase from FY20. Four were TFOA events involving communication wires, and four were injuries sustained during maintenance. The single inflight mishap resulted from a hydraulic pump failure.

Human factors continued to be the main causal factor in all mishap reports, with complacency being the most identified factor, occurring in 24% of all events. The most common material factors were trailing wire antenna separations and hydraulic system malfunctions.

The overall number of HAZREPs and Class E mishaps increased slightly from FY20, with 40 reports submitted. Of these 40, 13 were BASH reports, an increase of five from FY20. The majority of non-BASH reports were TFOAs, followed by hydraulic malfunctions.

Figure 23. Class A-D Aviation Mishaps

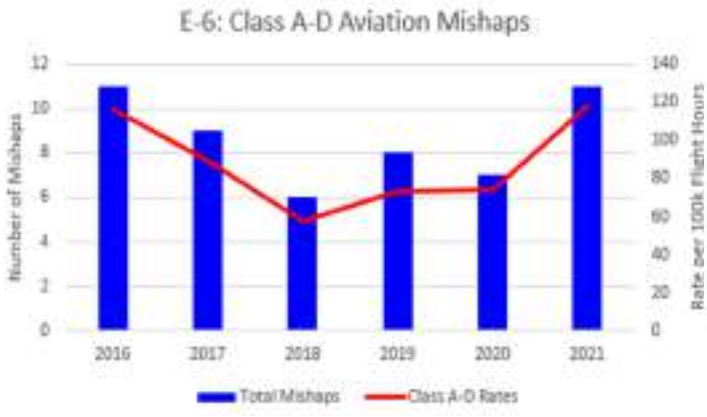


Figure 24. Class A-D Aviation Mishap Rates

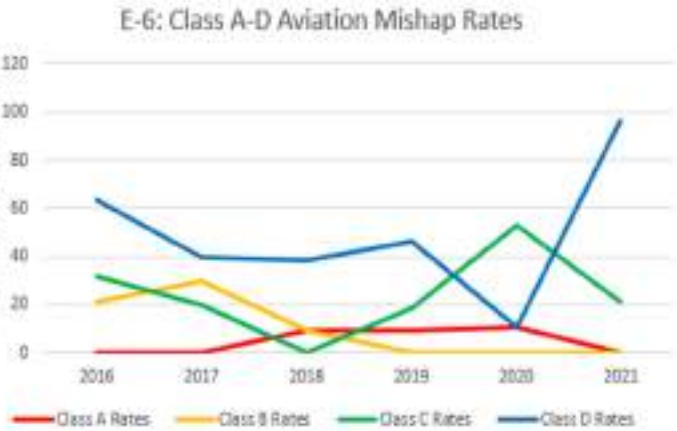


Figure 25. Class C Aviation Mishaps

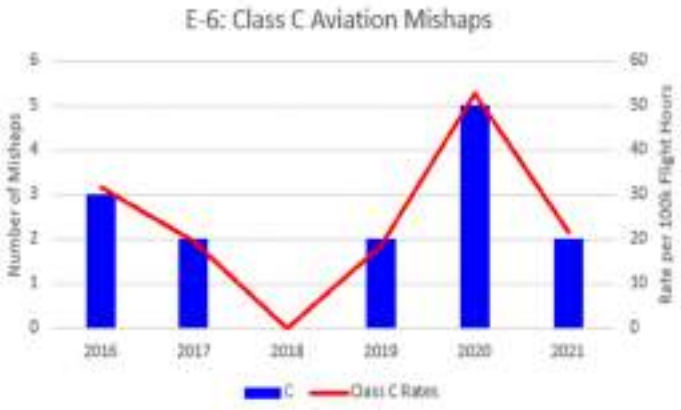


Figure 26. Class D Aviation Mishaps

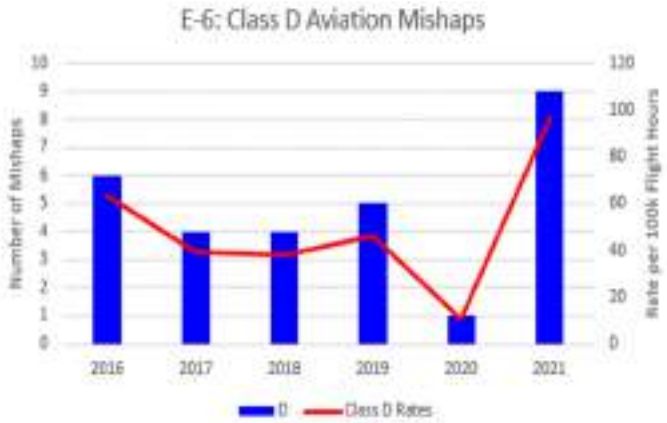
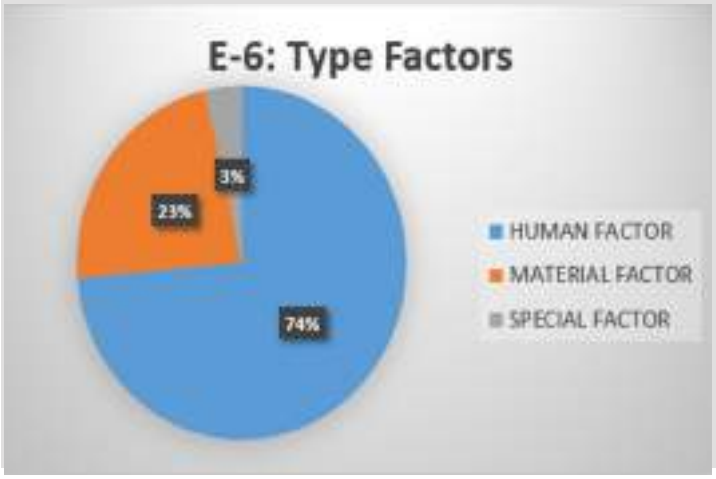


Figure 27. Type Factors



F/A-18A-F Hornet and EA-18G Growler

In FY21, the F/A-18/EA-18 community experienced a decrease in the total number of mishaps for the fourth year in a row. The Class A mishap numbers, however, have remained relatively steady since 2018. The overall reduction was mostly due to a continuing drop in reported Class C and D mishaps, which have declined since their highs in FY17.

Of the three Class A mishaps, two were caused by BASH occurring on low-level flights, and one was due to an in-flight engine fire. The only Class A involving total loss of aircraft was an ejection after a hydraulic issue, but the pilot recovered safely.

There were 19 Class B mishaps in FY21, up from the past three years, and slightly exceeding 2018 numbers. Eight of the Class B's were from damage due to ground handling or towing evolutions, three were from in-flight refueling FOD damage, two were engine fires, two lightning strikes, and one Class B each involved engine FOD, blown tire and subsequent gear damage, and airframe system failure leading to flight control system damage.

Human factors were cited more than twice as often as material factors across reported mishaps in the F/A-18/EA-18 community for FY21. The most commonly noted person-level precondition was complacency, which represented 22% of all causal human factors. Preconditions dealing with poor communication were the second most prevalent at 15%.

HAZREP submission declined 16% since last year, with 421 HAZREP and Class E mishaps submitted in RMI during FY21. The most common of these, 36%, were BASH reports, followed by TFOA at 28%. The third most frequently reported HAZREP/Class E's were ground handling injuries, crunches, and maintenance malpractice at 10%.

Figure 28. Class A-D Aviation Mishaps

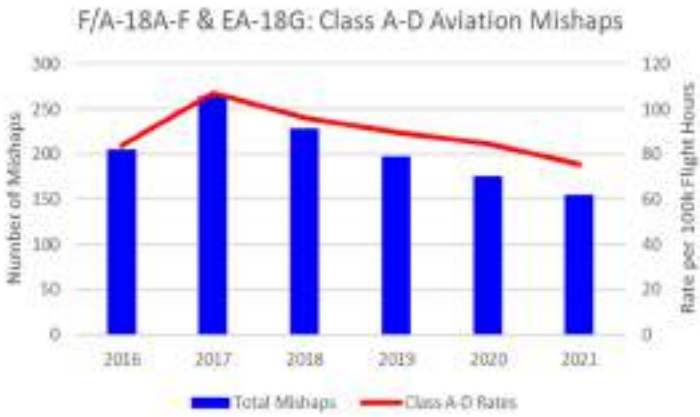


Figure 29. Class A-D Aviation Mishap Rates

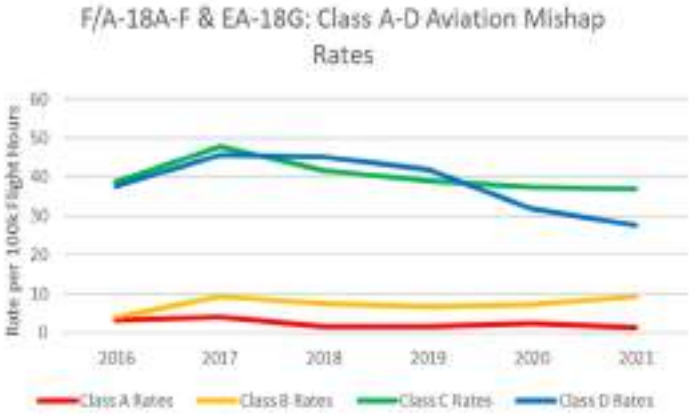


Figure 30. Class A Aviation Mishaps

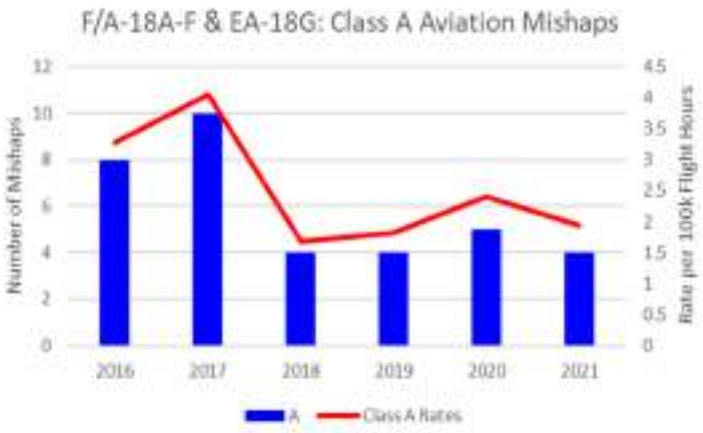


Figure 31. Class B Aviation Mishaps

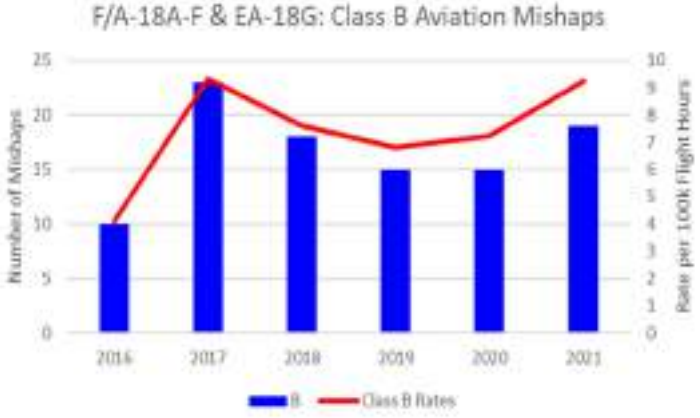


Figure 32. Class C Aviation Mishaps

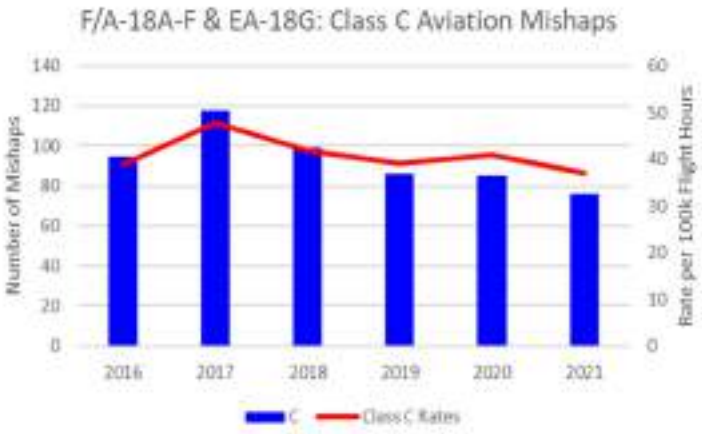


Figure 33. Class D Aviation Mishaps

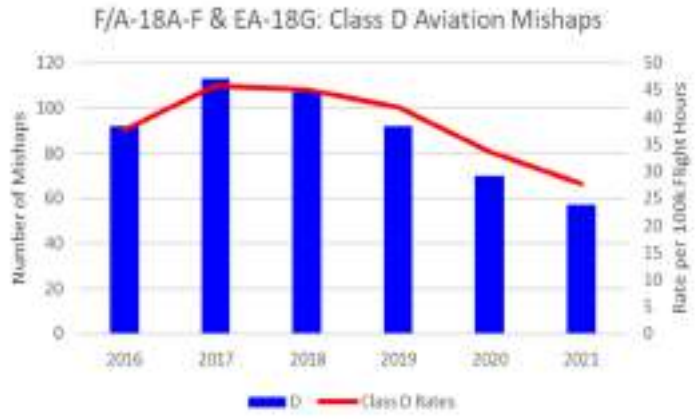
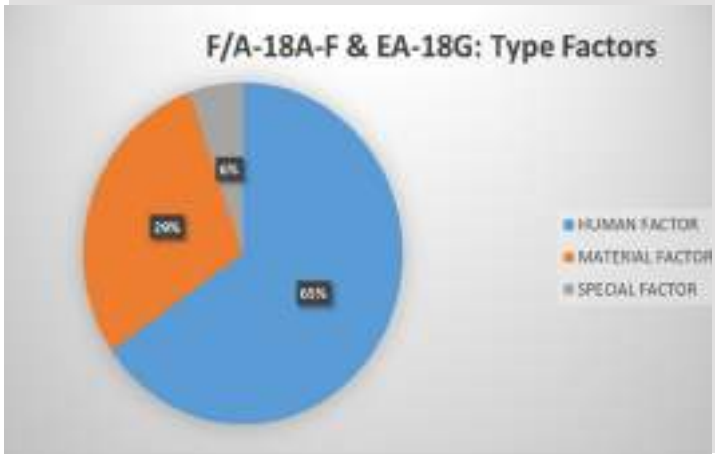


Figure 34. Type Factors



F-35 Lightning

The Lightning community experienced an increase in the total number of mishaps for FY21, but overall mishap rates per 100,000 flight hours slightly decreased from last year. This was due to rising airframe use and an overall increase in annual flight hours from F-35B and F-35C platforms.

The single Class A for FY21 involved FOD damage to an F-35C engine due to a tool accidentally left in the intake during startup. There were no Class B mishaps this year.

Class C mishaps more than doubled from FY20 to FY21. The most common cause was environmental/weather damage, with four Class C's due to either lightning or hail. Another three were due to maintenance procedural non-compliance, and there were two BASH mishaps. One each of the following were also reported: In-flight refueling drogue slap, landing gear damage post-high-speed abort, FOD from a failed semi-armor piercing high explosive incendiary round, bleed air leak, ground handling injury, flight deck tow crunch, lift fan door uncommanded opening, and a blown tire on a CVN landing.

Human factors were cited far more often than material factors in F-35 community reports and at a much higher percentage than the rest of the TACAIR community, potentially due to the relative newness of the airframe. Over 50% of all human factor preconditions were due to complacency.

HAZREP/Class E submissions decreased by 22% in FY21, with 43 reports. Fifty-six percent of all HAZREPs and Class E mishaps were BASH events, and among the remaining reports; the next most common were ground handling issues at 12%.

Figure 35. Class A-D Aviation Mishaps

Figure 36. Class A-D Aviation Mishap Rates

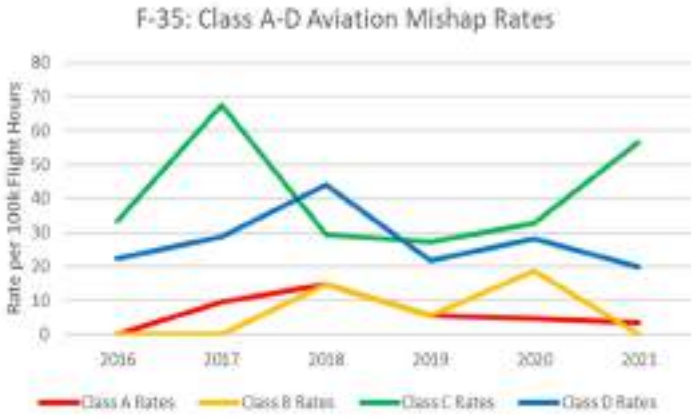


Figure 37. Class A Aviation Mishaps

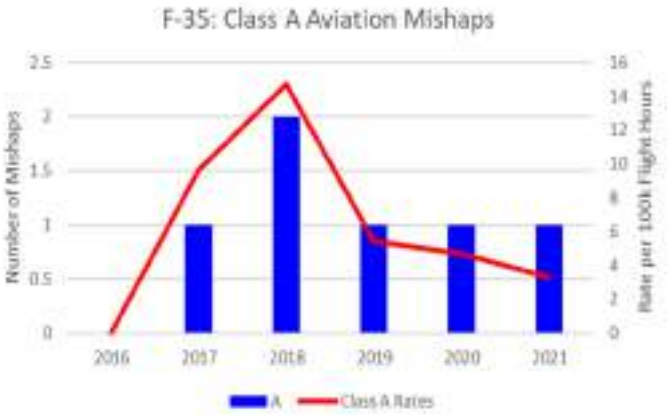


Figure 38. Class C Aviation Mishaps

Figure 39. Class D Aviation Mishaps

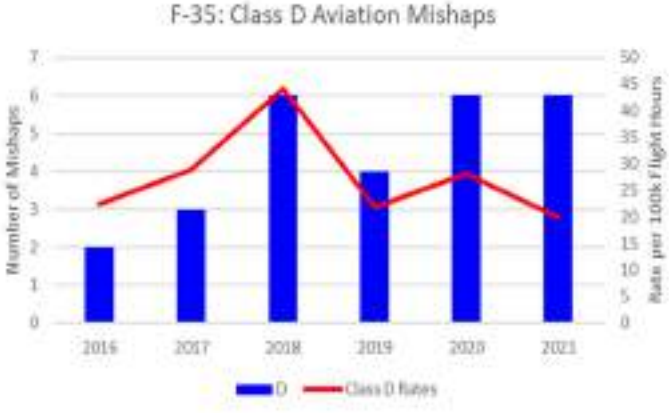
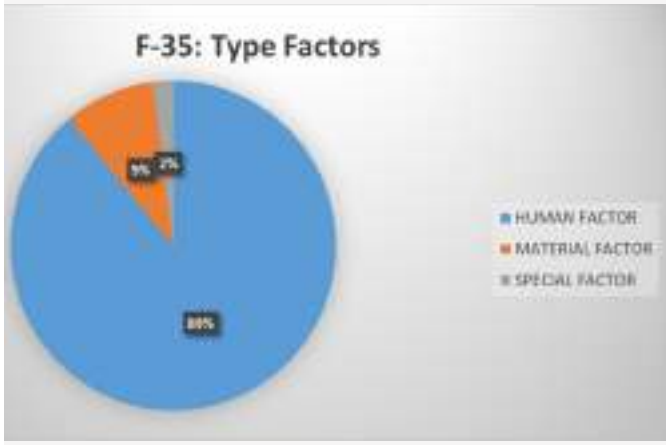


Figure 40. Type Factors



Maritime Patrol and Reconnaissance Aircraft (MPRA) P-3C Orion, EP-3E Aries II, and P-8A Poseidon

Overall, the MPRA community experienced an increase in the number of mishaps during FY21. This increase was due to a rise in the overall number of Class C and D mishaps compared to the previous year. There were zero Class A mishaps during FY21, and one Class B mishap resulting from inflight hail damage. Over half of all reported mishaps involved personnel injury, the majority of which occurred during maintenance or pre- or post-flight actions.

Figure 41. Class A-D Aviation Mishaps

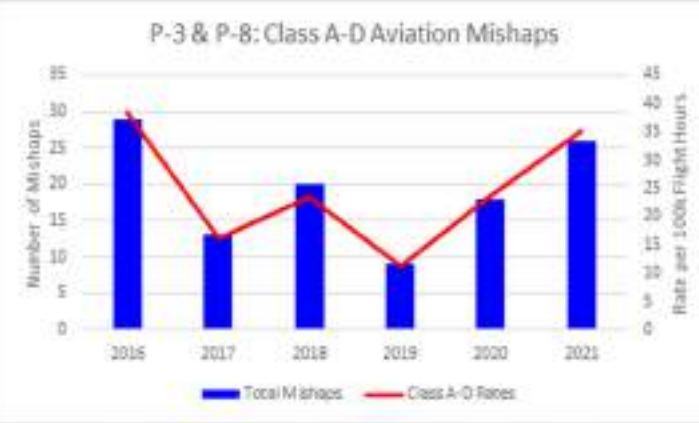
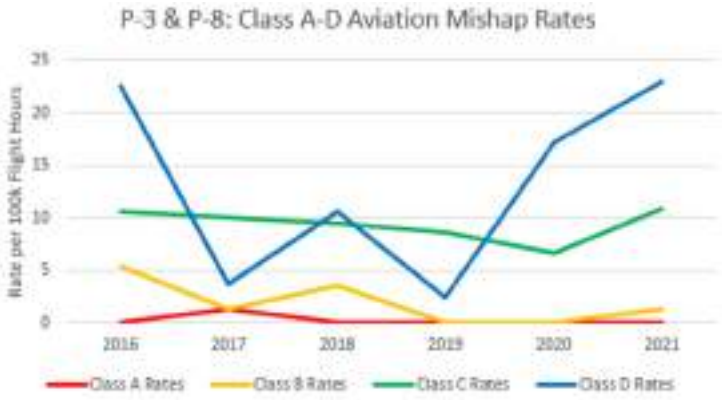


Figure 42. Class A-D Aviation Mishap Rates



Four of the eight Class C mishaps were due to personnel injuries. One notable injury mishap resulted from a catastrophic sonobuoy failure. Two inflight mishaps were the result of BASH events. The two other inflight mishaps were smoke/fire/fumes resulting in damaged avionics and brake damage from an aborted takeoff.

There were 17 Class D mishaps, of which 12 were the result of injuries. Of the remaining five, four were equipment malfunctions and one was a BASH event. This is the highest number of Class D mishaps for the MPRA community since 2016, continuing an upward trend.

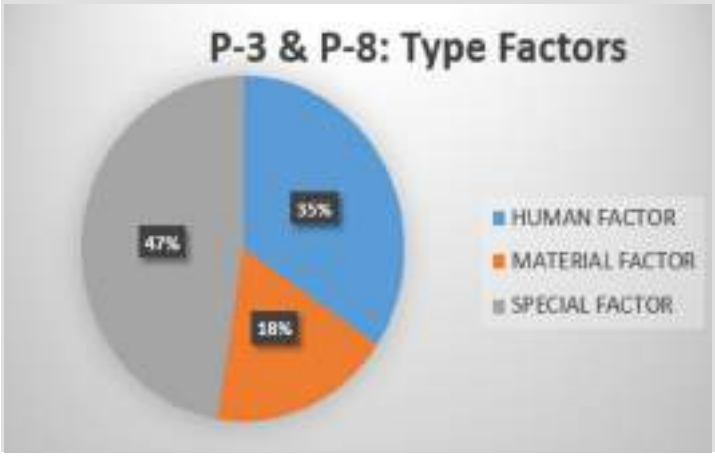
The most-cited causal factor for all mishaps and HAZREPs continues to be Special Factors, mainly attributed to BASH and weather events. Human Factors were attributed to 35% of all reports. The most commonly reported HFAC was complacency, occurring in 23% of all reports involving Human Factors.

The MPRA community continued to submit HAZREPs regularly. Of the 429 FY21 HAZREP and Class E mishap reports submitted to RMI, 314 (73%) were BASH reports, and 283 of those BASH reports (90%) were from the P-8A.

Figure 43. Class C Aviation Mishaps

Figure 44. Class D Aviation Mishaps

Figure 45. Type Factors



Fixed Wing Training Series

Fixed Wing Training Series aircraft showed a decrease in mishap rate for all mishap classes in FY21 except Class A mishaps which increased.

Class A mishaps were of most concern in FY21 for Fixed Wing Training Series aircraft. Most concerning, after showing zero Class A mishap in FY20, there was a significant increase in Class A mishaps in FY21 with four events. Although these were caused by a myriad of factors, due diligence is required to ensure this doesn't continue in FY22.

Fixed Wing Training Series aircraft showed a reduction in Class B mishaps with zero for FY21.

There was a reduction in Class C mishaps for FY21 although this category accounts for the largest percentage of mishaps within the Fixed Wing Training Series communities. There were 10 Class C mishaps in FY21. Sixty percent of these mishaps occurred during landing which included multiple aircraft departing the runway, prop strike and wingtip damage. Other Class C mishaps were due to BASH and engine over-temp on startup.

There were two Class D mishaps, both due to bird strikes.

Figure 46. Class A-D Aviation Mishap Rates

Figure 47. Class A-D Aviation Mishaps Rates

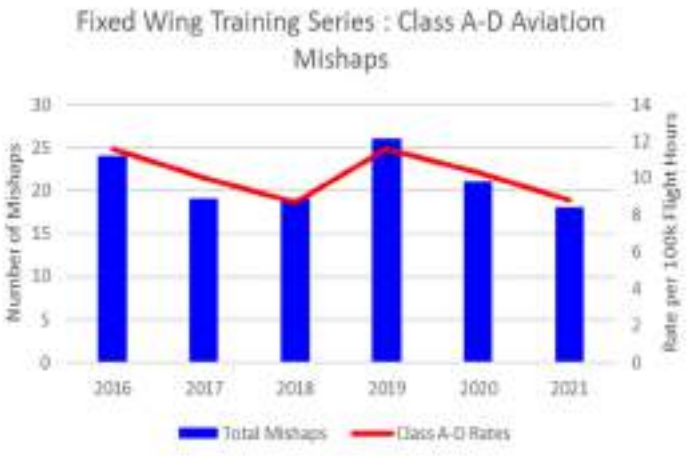


Figure 48. Class A Aviation Mishaps

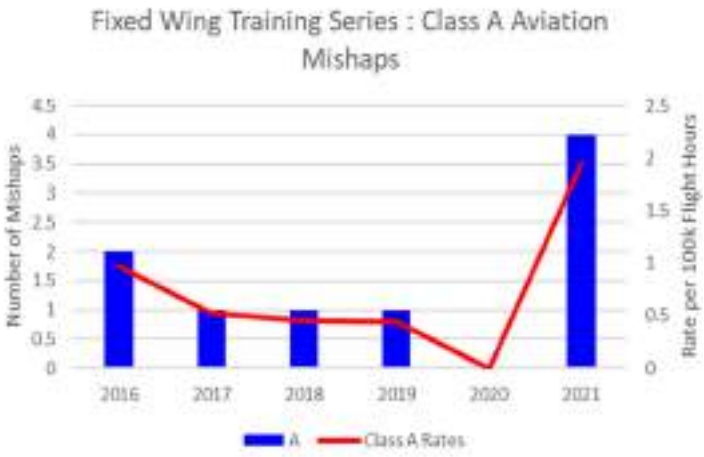


Figure 49. Class B Aviation Mishaps

Figure 50. Class C Mishaps

Figure 51. Class D Aviation Mishaps

AV-8B Harrier

The AV-8B community saw a continued decline in mishaps during FY21, marking a 14-year low. This decrease in mishaps correlated with a continuous decrease in flight hours as the Marine Corps sun downs the airframe. AV-8Bs fell below 15,000 annual flight hours for the first time this year resulting in a Class A-D combined mishap rate decrease to the low teens per 100,000 flight hours.

FY21 Class C mishaps reverted back to the decreasing trend line after an unusual spike in FY20. All classes of mishaps continued to decline or maintained a low rate after small overall spikes in 2019 and 2020.

Both FY21 mishaps had no human causal factors with the Class D resulting from a wildlife strike and the Class C canopy failure resulting from a stress crack due to a failed dampener. However, FY16-FY20 AV-8B mishap data showed human factors were overwhelmingly the root cause of mishap causal factors. Based on mishap reporting, AV-8B leading causal mishap HFAC preconditions were as follows:

- State of mind
- Complacency
- Overconfidence

The AV-8B experienced four Class E mishaps, three of which were TFOA related, and one AGM. Fiscal '21 hazard reporting in the AV-8B community was below the previous three years even when corrected for the incorporation of the Class E classification. The 12 AV-8B FY21 HAZREPS consisted of three BASH events, one physiological episode, two night vision device incidents, two FOD incidents, and four reports of unsafe acts and conditions during maintenance activities and flight operations.

Figure 52. Class A-D Aviation Mishaps

Figure 53. Class A Aviation Mishaps

The MPRA community continued to submit HAZREPs regularly. Of the 429 FY21 HAZREP and Class E mishap reports submitted to RMI, 314 (73%) were BASH reports, and 283 of those BASH reports (90%) were from the P-8A.

Figure 54. Class B Aviation Mishaps

Figure 55. Class C Aviation Mishaps

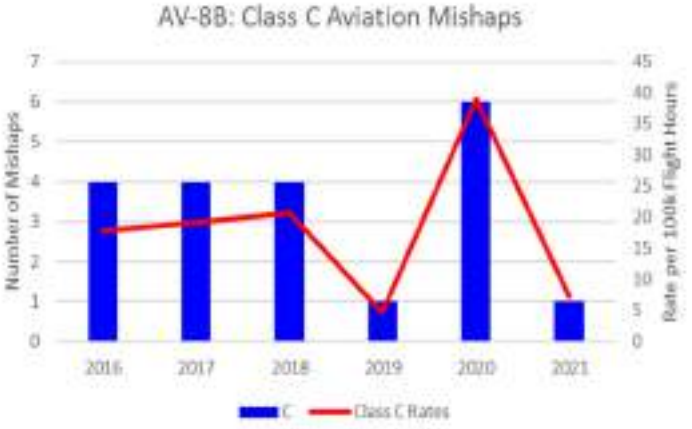


Figure 56. Class D Aviation Mishaps

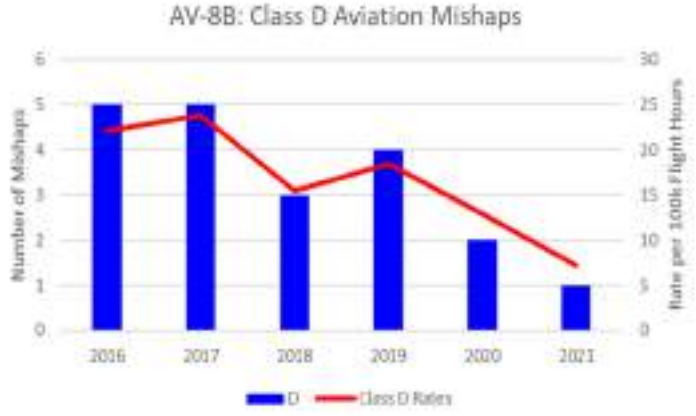
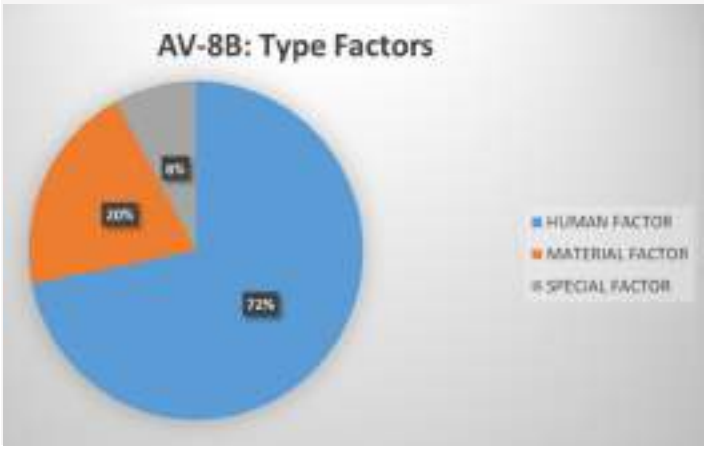


Figure 57. Type Factors



F-5 / F-16 Aggressor

The Navy Aggressor community continued to report low numbers of mishaps, with two for FY21. The most notable was an F-5N that experienced Class B damage from a CFIT power line collision during a low-level flight, and the other was a Class C ground handling injury.

Figure 58. Class A-D Aviation Mishaps

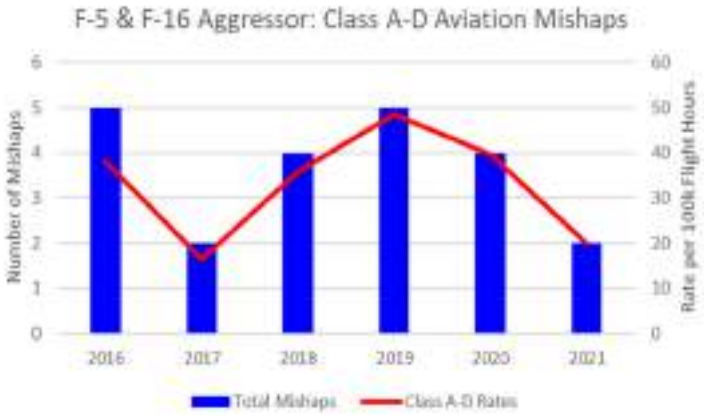
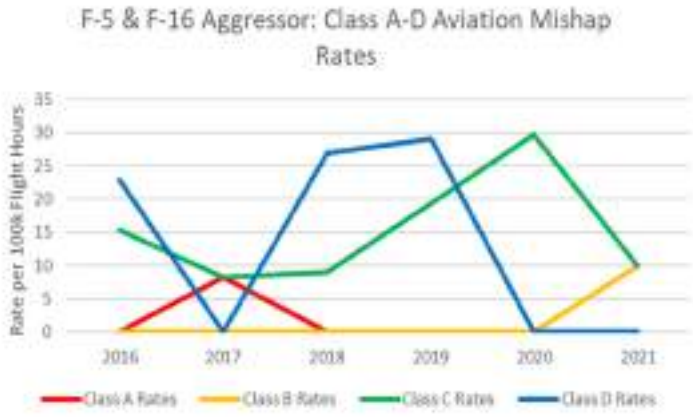


Figure 59. Class A-D Aviation Mishap Rates



Reflecting the rest of the TACAIR community, HFACs continued to be the most cited in mishaps, even considering the age of the airframes in question. Twenty-three percent of all HFAC preconditions were due to complacency, which is the most commonly cited human factor in naval aviation.

HAZREP submission was on an improving trend since last fiscal year, with FY21 seeing a 63% increase from the aggressor community. One notable HAZREP highlighted a lack of environmental control system airflow at low throttle settings at high altitude in the F-5F. Some other HAZREPs dealt with F-5N engine flameouts, air data computer failures, and a dual generator failure.

Figure 60. Class B Aviation Mishaps

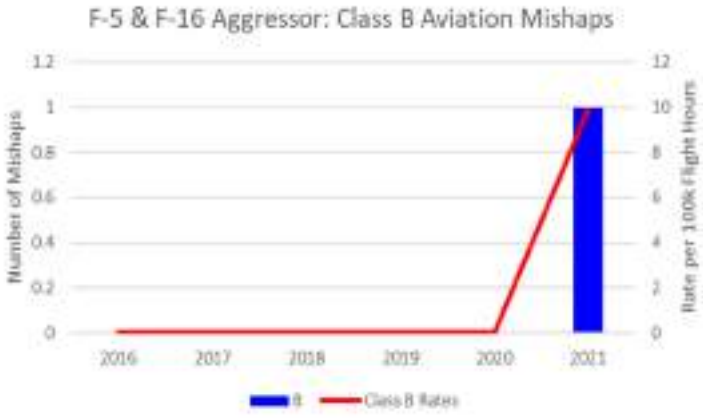


Figure 61. Class C Aviation Mishaps

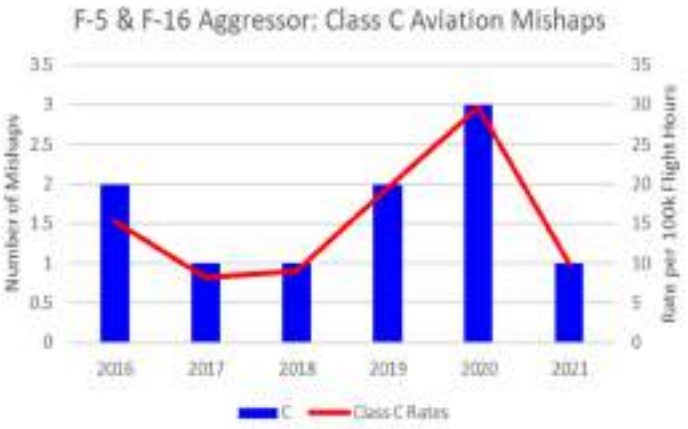
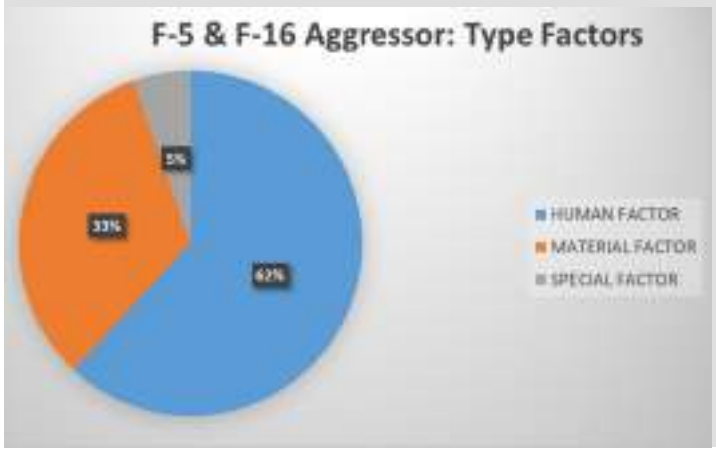


Figure 62. Type Factors



MH-60S Knighthawk / MH-60R Seahawk

Overall, the H-60 community saw a slight increase in mishaps during FY21. While Class A through Class C mishaps remained relatively stable, there was a substantial increase in Class D mishaps during FY21. There were two Class A mishaps in FY21. There was a crash into a mountainside at high altitude and a crash into the sea after a landing on aircraft carrier.

The two Class B mishaps were due to an injury during a search and rescue evolution and an incident where several helicopters were exposed to AFFF after an accidental discharge.

While Class C mishaps decreased by one, Class D mishaps increased by 14. This reverses a steady downward trend for class D mishaps since 2018 and is 23% higher than any other fiscal year Class D total since 2016.

FY16-FY21 H-60 mishap data shows human factors are overwhelmingly the root cause of H-60 mishaps. Based on mishap reporting, H-60 leading causal mishap HFAC preconditions were as follows:

- **State of Mind**
  - Complacency
  - Overconfidence
  - Inaccurate expectations

- **A breakdown in teamwork**
  - Critical information not being communicated; failed to effectively communicate
  - Failure of crew / team leadership
  - Task / mission planning / briefing inadequate

- **Supervisory causes**
  - Failed to identify/correct risky or unsafe practices
  - Failed to provide appropriate policy/guidance
  - Supervisory/Command oversight inadequate

- **Mental awareness**
  - Not paying attention
  - Fixation

- **Organizational Influences**
  - Provided inadequate procedural guidance or publications

Of the 162-plus Class E events submitted in FY21, almost half of events could be contributed to TFOA (80), an issue that plagues the H-60 community. There were 172 HAZREPs submitted in FY21, 37% of which were BASH events (64).

Figure 63. Class A-D Aviation Mishaps

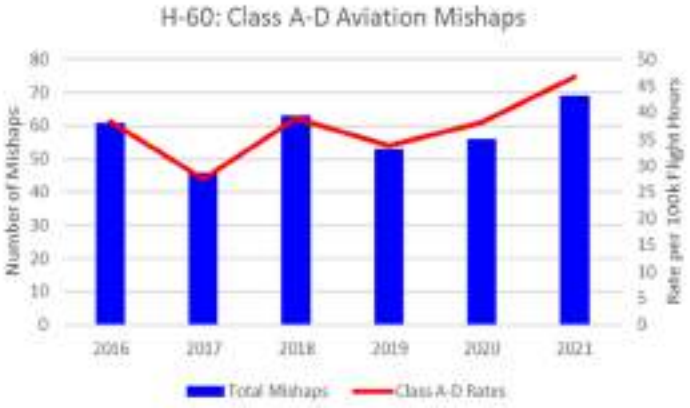


Figure 64. Class A-D Aviation Mishap Rates

Figure 65. Class B Aviation Mishaps

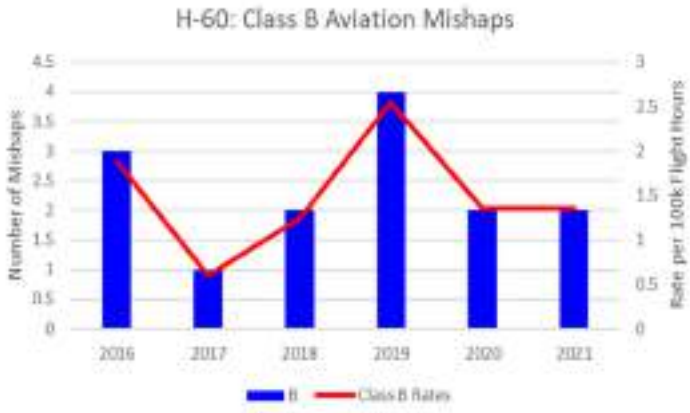
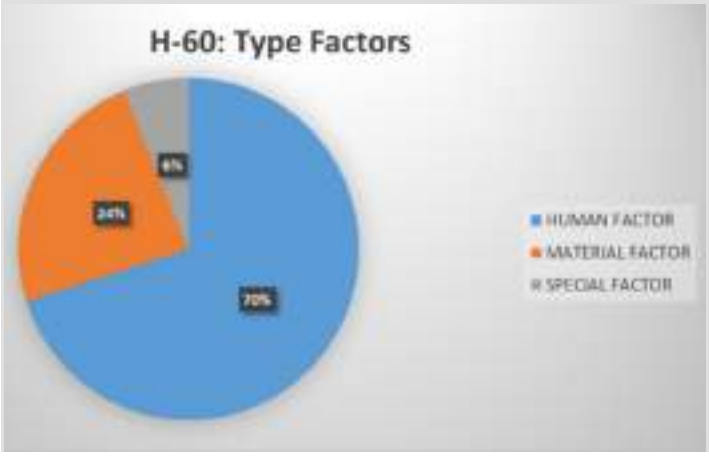


Figure 66. Class D Aviation Mishaps

Figure 67. Type Factors



MV-22B / CMV-22B Osprey

Overall, the MV-22B community saw a rise in the number of mishaps and in the rate of mishaps per 100,000 flight hours during FY21. Of note, this was the first full fiscal year of the CMV-22B flying operationally. The rate and number of Class A and C mishaps continued downward this year, but the opposite was true of B and D reports.

There were no Class A mishaps during FY21, meaning there has been only one in the last four fiscal years. Five Class B mishaps were reported this year, up from four last year. This year's Class B reports consisted of a maintainer fall causing severe injury, a damaged FLIR during a hung gear landing engine, a blade damaged during maintenance, a nacelle strike during a shipboard landing, and a compressor stall that led to an engine over-torque.

The fleet reported 15 Class C mishaps in FY 21, down from 17 in FY20. These included two injury-related reports and two reports related to damage to hub components. Of note, four reports involved damage to prop rotor blades during TFOA, BFWS, or maintenance evolutions. The rate and number of Class D mishaps continued to climb. Five of these reports were BASH, three were injuries, and two were TFOAs. Human factors remain the primary factor in mishaps, accounting for 72% of all factors. "Complacency" is the most cited precondition, 94 times, with "Critical information not communicated" at 36 occurrences, the second highest. The most common Supervisory factor was "Failed to provide appropriate policy/guidance" and by far the most common Organizational factor was "Provided inadequate procedural guidance or publications."

The V-22 community released 190 Class E and Hazard reports in FY21. Thirty-five (18%) of these reports were BASH, 26 (14%) were TFOA, and 22 (12%) were unauthorized laser events (ULE).

Figure 68. Class A-D Aviation Mishaps

Figure 69. Class A-D Aviation Mishap Rates

Figure 70. Class A Aviation Mishaps

Figure 71. Class B Aviation Mishaps

Figure 72. Class C Aviation Mishaps

Figure 73. Class D Aviation Mishaps

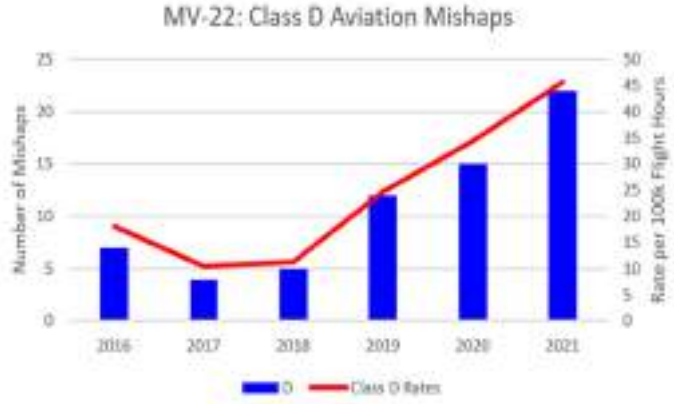
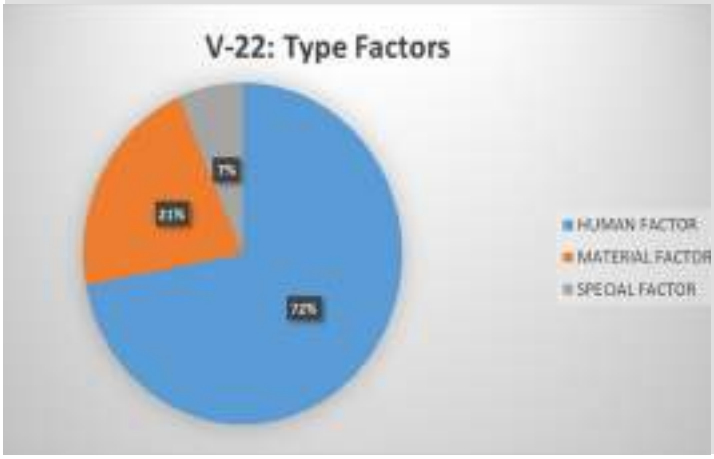


Figure 74. Type Factors



CH-53E Super Stallion, CH-53K King Stallion, and MH-53E Sea Dragon

The Navy and Marine Corps H-53 communities reported 43 mishaps in FY21 including three Class B, 19 Class C, and 21 Class D events. While there were no Class A mishaps this year, Class B, C, and D events were all reported at significantly higher rates.

In the previous five years, the H-53 communities averaged 12.6 Class C and 5.8 Class D events. In FY21, H-53 communities reported 19 Class C and 24 Class D events. This showed a dramatic increase in reporting, particularly in Class D events. Minor injury mishaps constituted a significant portion of the Class C and D mishaps with six of the 19 Class C events (32%) due to injury. Of the 24 Class D events, there were 12 (50%) total injuries, with five of those injuries due to falls.

Mishap rates within the CH and MH-53 communities were nearly three times that of the previous year, per 100,000 flight hours, with the most significant increase being in Class D events. Total flight hours remained consistent with FY20 so this can likely not be attributed to an increase in flight tempo. An increase in minor aircraft-related injuries, in association with increased reporting accountability within RMI versus the legacy WESS system, seemed to be driving this significant increase.

H-53 communities reported 36 Class E reports, of which 56% were due to TFOA.

Marine and Navy H-53 squadrons continued to use the HAZREP process to document issues and trends, and to provide valuable safety information to the fleet. Fiscal '21 HAZREP trends included BASH incidents, material aircraft concerns, and ULE. A significant carryover from FY20 was the continued reporting of reliability issues with white phosphor night vision goggles.

Sixty-nine percent of causal or contributory factors were attributed to HFACs, 26% due to material factors, and 5% due to special factors. Nearly 25% of all HFAC preconditions involved an element of complacency while 12% involved challenges in communication. By far the most predominant human factor on the supervisory and operation levels was inadequate policy or publication guidance.

Figure 75. Class A-D Aviation Mishap Rates

Figure 76. Class A Aviation Mishaps

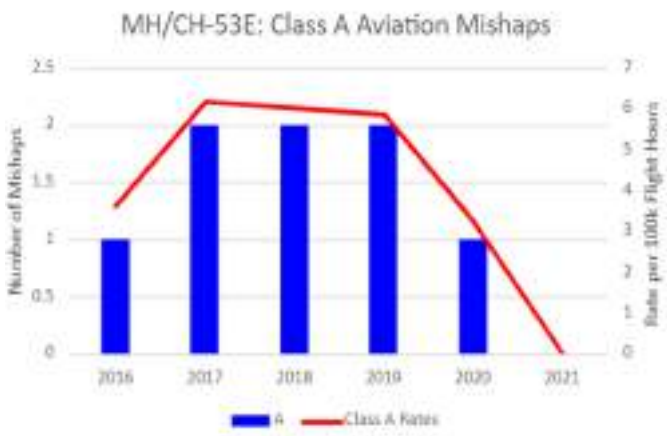


Figure 77. Class B Aviation Mishaps

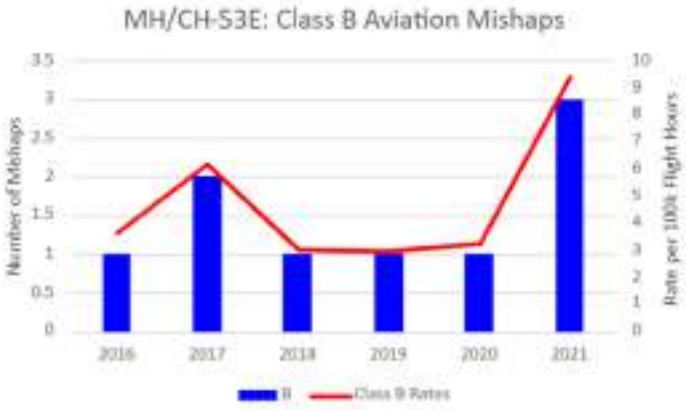


Figure 78. Class C Aviation Mishaps

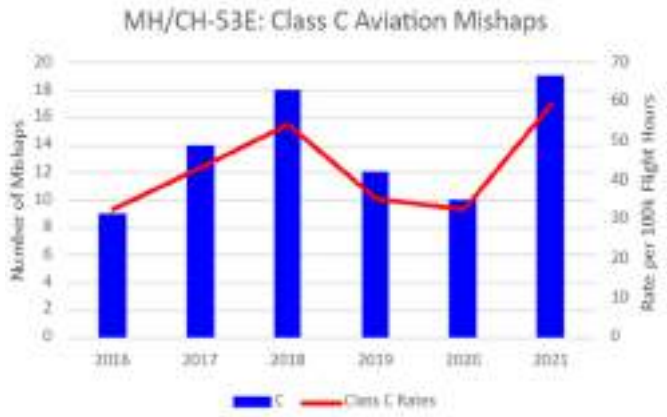


Figure 79. Class D Aviation Mishaps

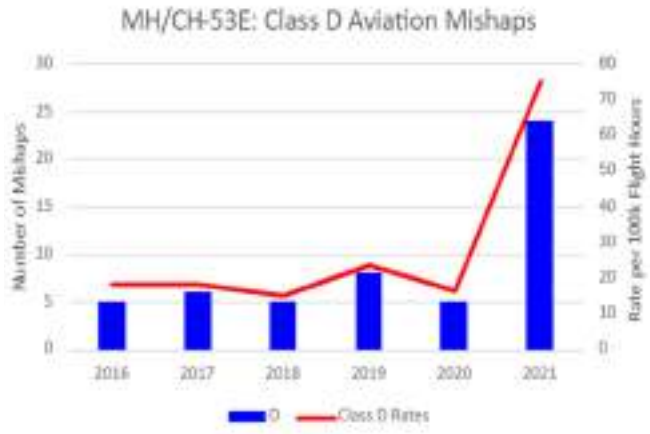
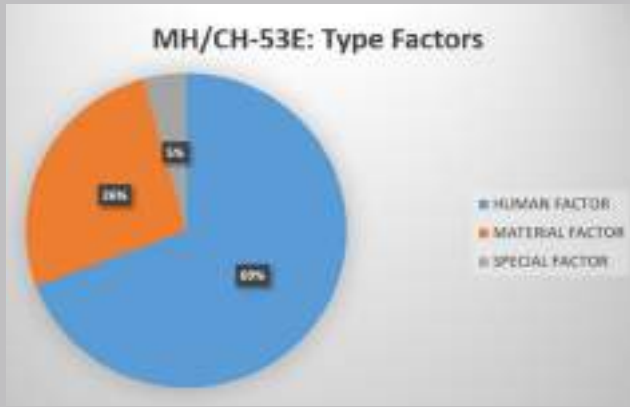


Figure 80. Type Factors



Light Transport (C-12, C-20, C-26, C-35, and C-37)

The light transport community consists of commercial corporate-style propeller and jet engine aircraft that perform the operational support airlift (OSA) mission of moving passengers and cargo globally. Unlike Navy and Marine Corps tactical squadrons, light transport squadrons and detachments rely exclusively on contract maintenance. Given the relatively few OSA aircraft in the naval inventory, even a single mishap is significant despite the disproportionally large number of OSA flight hours flown. In FY21, the light transport community mishaps increased but remained below the five-year average. The light transport community has not seen a severe mishap since FY15 in which there was a Class A involving a C-20 landing gear malfunction. The last Class B mishap occurred in FY12 involving a UC-35D bleed air failure.

In FY21, the light transport community experienced two Class C mishaps, increasing from the previous fiscal year, but not exceeding the five-year average. The mishaps involved a hard landing during training and damage to engine inlet vanes from an unknown source. The single FY21 Class D mishap occurred due to a lightning strike in flight. Aging OSA airframes combined with higher wear and tear from non-tactical profiles were trends seen in the light transport community.

Due to the single Class C mishap, this is the first fiscal year in which human factors exceeded material factors in mishap casual factors. However, it is premature to make a trend analysis based on a single mishap and fiscal year. Aging OSA airframes, the non-tactical mission profiles flown, and exclusive use of contract aircraft maintenance support are conducive to larger material factor issues.

Light transport experienced four Class E mishaps two of which were BASH related, and one lightning strike in flight. The final Class E mishap involved landing gear damage due to a misalignment on gear doors attributed to aging components.

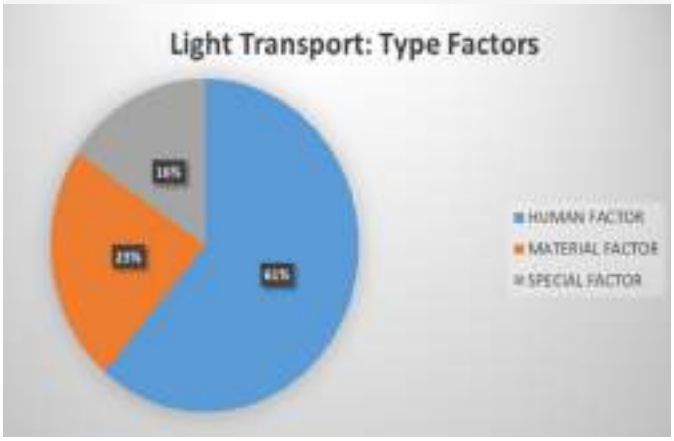
The light transport community operates globally, most acutely in and around the world's coastal regions and congested airspaces. As a result, BASH (12) and Air Traffic Control / Near Midair (three)-related hazards constituted a significant portion of FY21 HAZREPs (25). The majority of the remaining HAZREPs were the result of hazards associated with various aircraft material failures and malfunctions.

Figure 81. Class A-D Aviation Mishaps

Figure 82. Class C Aviation Mishaps

Figure 83. Class D Aviation Mishaps

Figure 84. Type Factors



TH-57B/C Sea Ranger Helicopter

The Navy and Marine Corps' current helicopter training aircraft, the TH-57, had seen an overall reduction in reported Class A-D mishaps from FY16 to FY19, however mishap numbers have been trending upward from FY19 to FY21. The TH-57B/C's relatively low cost of $3.3 million leads to a minimal possibility of incurring a higher threshold mishap. Fiscal '21 saw the first Class A mishap since FY15, a crash at an outlying field during contact maneuvers.

Class C rates were declining since FY16 but climbed to five in FY21. The rise in Class C events was the result of two hard landings and three engine temperature exceedances. Class D rates continued to steadily decline since FY18.

The TH-57 had 10 Class E events, all of which were TFOAs. Trends will continue to be monitored closely as the Navy and Marine Corps' new helicopter training aircraft, TH-73, is introduced at NAS Whiting Field, Florida.

FY16 - FY21 mishap and HAZREP data showed when the TH-57 community had a mishap or hazard event, human factors were overwhelmingly cited as causal.

Based on TH-57B/C mishap and hazard reporting, the leading causal HFAC preconditions were as follows.

- **Mental awareness**
  - Confusion
- **A break down in teamwork**
  - Failure to effectively communicate
- **State of mind**
  - Complacency
  - Inaccurate expectation
  - Task over-saturation/under-saturation

Figure 85. Class A-D Aviation Mishaps

Figure 86. Class A-D Aviation Mishap Rates

Figure 87. Class C Aviation Mishaps

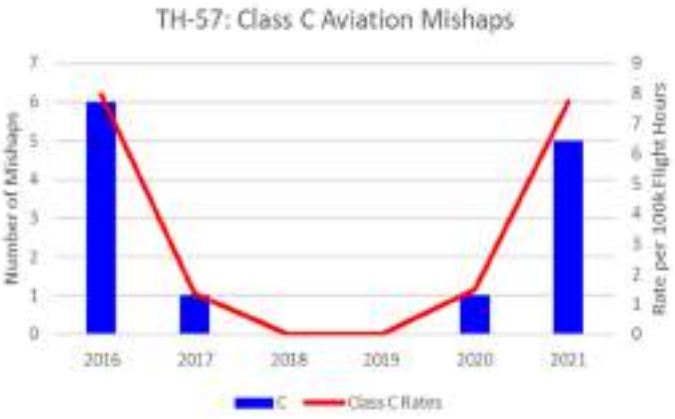


Figure 88. Class D Aviation Mishaps

Unmanned Aircraft Systems (UAS)

Overall, the UAS community saw a slight decrease in mishaps in FY21; however, the five-year mishap rate still has an upward trend. The greatest number of mishaps by T/M/S continued to be the RQ-21 Blackjack, accounting for 69% of all reported mishaps. The majority of the RQ-21 mishaps were a result of mast strikes on recovery or belly landings following a malfunction. Of note, the MQ-4C, RQ-4A, and MQ-9A T/M/S all reported zero mishaps in FY21.

There were three Class A UAS mishaps in FY21. One involved a MQ-8B impacting the side of the ship and two from MQ-8Cs, a rotor strike and an inflight loss of control.

FY16 - FY21 mishap and HAZREP data showed the top three causal factor issues were:

- Inadequate infrastructure
- Failed to effectively communicate
- Purchasing or providing poorly designed or unsuitable equipment

Figure 89. Class A-D Aviation Mishaps

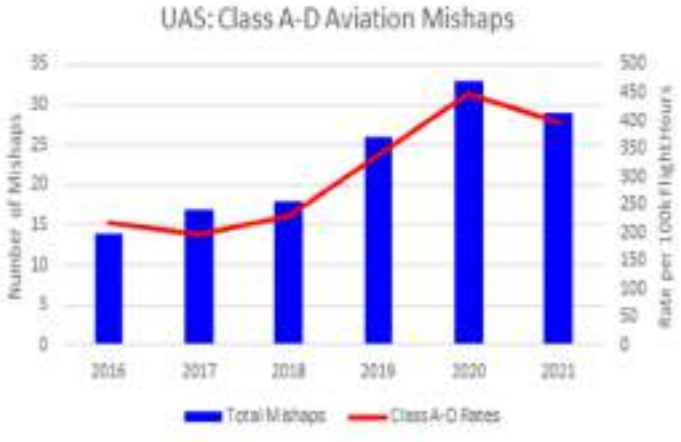
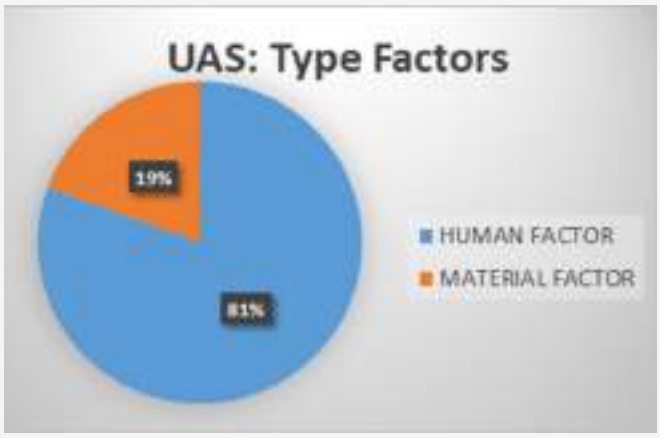


Figure 90. Type Factors



H-1 Helicopter

Overall, the H-1 mishap rate saw an increase in FY21. There were zero Class A mishaps and Class B mishaps reduced slightly, however Class C mishaps increased dramatically, returning to the same levels as before FY20. The 19 Class B/C/D mishaps in FY21 were split between nine AH mishaps and 10 UH mishaps. Of the 19 total mishaps, 10 were ground related and nine involved flight. The H-1 community experienced a large spike in over-G events leading to mishaps in FY21. The community saw a large increase in over-speed events starting in late FY20, continuing through FY21. MAG-39, as T/M/S lead, is leading an effort to investigate root causes of these events and potential fixes.

Based on mishap reporting from FY16-FY21, the H-1 community's leading causal mishap human factor preconditions were:

- Complacency
- Critical information not communicated
- Failed to effectively communicate
- Not paying attention

Fiscal '21 hazard reporting is slightly above the five-year average of 54.3 reports per fiscal year and maintains an even split between UH and AH reporting consistent with current aircraft distribution. The big addition to this category was Class E mishaps. There were 21 Class E mishaps reported, in addition to the 55 hazard reports. This was a big increase, and a step in the right direction for identifying and highlighting the issues across the community.

H-1 community HAZREP trends for FY21 included:

- Digital Engine Control Unit (DECU)
- BASH
- TFOA
- ULE
- Air traffic control
- Near midair

Some of these events across the community also continued to identify issues with publications and guidance from higher or outside agencies. With the community being comprised of "new" aircraft, the identification of these issues along with the recommended changes will continue to improve the community long-term. Many issues with the DECU and the way FCF is conducted have recently been identified and highlighted, leading to an effort to correct deficiencies in publications as well as pilot training.

Figure 91. Class A-D Aviation Mishaps

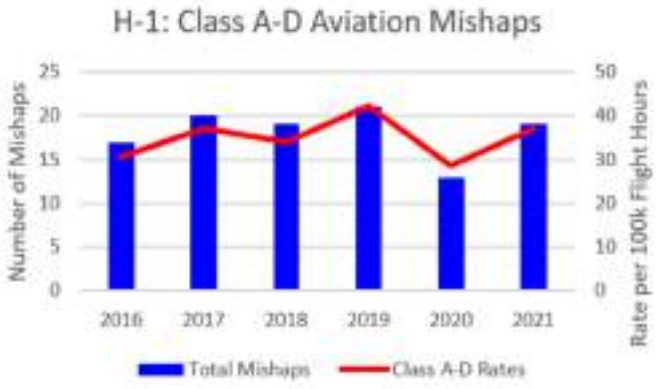
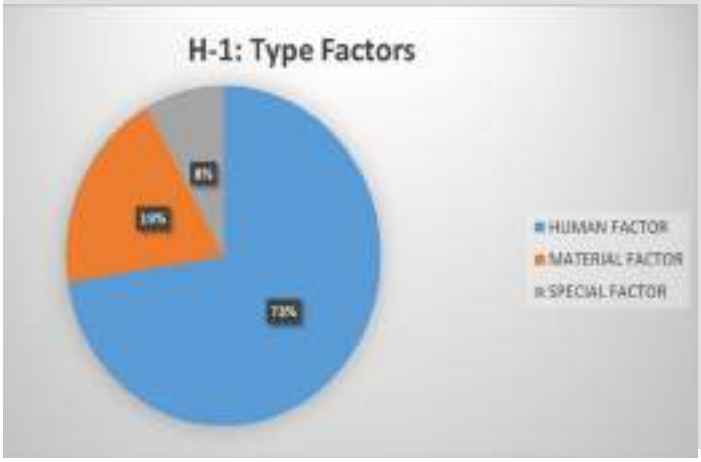


Figure 92. Class A-D Aviation Mishap Rates

Figure 93. Type Factors




* FOLLOW PROCEDURES * FOLLOW PROCEDURES * FOLLOW PROCEDURES *
THE LEADING CAUSE OF AVIATION GROUND MISHAPS OVER THE LAST DECADE HAS BEEN THE FAILURE TO FOLLOW PROCEDURES.
Lives are at stake if procedures are not followed!

APPENDIX B: CODE 20

SHORE SAFETY DIRECTORATE

About Us

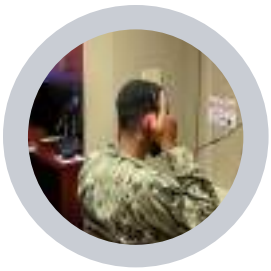
The Shore Safety Directorate (Code 20) is responsible to Chief of Naval Operations (CNO) N09F/ Commander, Naval Safety Center (COMNAVSAFECEN) for promoting, monitoring, and evaluating selected safety and occupational health (SOH) programs for the U.S. Navy. Code 20 serves as the command's subject matter experts (SME) for the following assigned naval safety programs: occupational safety and health (OSH), traffic safety, recreational/off-duty safety, acquisition safety, and safety training.

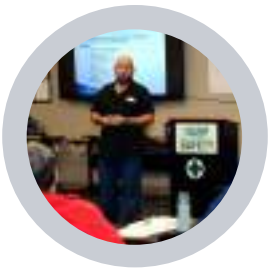
Code 20 is charged with developing and formulating naval safety OPNAV policy and directive guidance on behalf of COMNAVSAFECEN and keeping policy current and in compliance with all higher-level guidance, including assigning a directives custodian for each of the following assigned directives: OPNAVINST 5100.23 series, Navy Safety and Occupational Health Program, OPNAV M-5100.23, Navy Safety and Occupational Health Program Manual, N09F-NTSP-S-40-8603E/A, Navy Safety and Occupational Health Navy Training System Plan, and OPNAVINST 5100.27 series, Laser Safety.

Additionally, the Shore Safety Directorate provides membership on boards, committees, councils, working groups, and task forces that influence or impact naval safety. The directorate maintains effective contact and liaison with military and civilian personnel of the Office of the Secretary of Defense (OSD), Department of the Navy (DON), CNO, systems commands, Navy type commands, Navy and Coast Guard commands, other federal agencies, private industry, and foreign governments as appropriate to accomplish the mission of the directorate and the NAVSAFECEN.

Additional Shore Safety functions include:

- Assesses SOH programs and the sufficiency of Navy Echelon II oversight of naval safety policies and practices through the execution of a comprehensive safety assurance process that includes reviewing a wide range of data and information to identify unmitigated safety risks, highlighting leading indicators or heightened risks in reports, papers, and summaries, and tracking corrective action implementation.
- Provides technical assistance, advice, and informational material for use in conducting safety program management and mishap prevention programs, and in promoting active and sustained Navy-wide interest in mishap prevention.
- Manages the shore and systems commands portions of the CNO Safety Awards program, including screening submissions and making selection recommendations to the NAVSAFECEN.
- Writes final endorsement drafts on all shore and systems command Class A mishaps on behalf of the commander.
- Tracks all shore and systems command mishap and hazard recommendations to verify the appropriate corrective actions have been completed and coordinated to prevent recurrence.
- Leads the data collection, consolidation, preparation, and review for DON's SOH reporting, including the Occupational Safety and Health Administration (OSHA) Annual Report and the annual Bureau of Labor and Statistics (BLS) Report.
- Monitors the Navy's participation in OSHA's Voluntary Protection Program.
- Chairs the Navy's Safety Quality Council (SQC) and augments the Office of the Naval Inspector General (NAVINSGEN) inspections of headquarters commands and area visits as well as SOH inspections.
- Serves as NAVINSGEN's SOH SME. Provides SME expertise and assistance to Navy commands for OSHA regulations and inspections. Manages citations, appeals, and alternate standards.





2021 Overview

The Shore Safety Directorate (Code 20) had an outstanding year. Safety Program Management (SPM) was one of our major focus areas, and two of the SPM modules, Inspections and Hazard Abatement were released in CY21. The inspections module allows for scheduling, conduct of report generation and tracking until closure of safety inspections, assessments, and evaluations leading to greater efficiency and common processes.

The Inspections module has a functional capability to record OSHA inspections, and archive correspondence and documents. The Hazard Abatement module allows for the documentation of all discrepancies and deficiencies from inspections, assessments, and audits. It allows tracking from report generation until closure and serves as repository for all documentation. Both modules function intuitively and seamlessly interface with each other. Additionally, Code 20 developed and conducter user training, hosting 54 live web training sessions in various time zones resulting in 587 trained personnel throughout the naval enterprise.

The SPM modules are intended to serve as the all-inclusive safety program and information management system and eventual replacement for the Enterprise Safety Application Management System (ESAMS). In CY22, the Navy will continue developing Risk Management Information (RMI) to report, store, link authoritative data sources, analyze, and distribute data needed to effectively manage risk, and allow personnel at all levels of the DON to make more informed risk decisions based upon actionable data.

The Shore directorate initiated a line of effort (LOE) for Safety Professional Development. The NAVSAFECEN's LOE 21-03 titled Safety Professional Development was carried out to assess and develop safety professional competencies throughout the naval enterprise by refining and aligning education and qualification requirements to further enhance support. This LOE focused on the knowledge and skillsets of our safety advocates and professionals.

Additionally, Code 20 presented the Safety Case Model for safety resilience at the Navy's Professional Development Symposium and the American Society of Safety Professionals (ASSP) national conference. The proof of concept effectively and accurately displayed that the Fall Protection problem addressed in the model was mapped to safe to operate and operate safely conditions. It was further proven effective by Surface Forces Atlantic's use to map an issue with the integrated bridge navigation system.

The directorate also provided support to ensure the successful release of RMI by training, leading development of the supervisory report, feedback development and processing, and support to SPM development teams.

SAFETY POLICY

- Changes were completed to the OPNAV Safety Manual M-5100.23 (change 1), officially signed out May 26, 2021. OPNAV M-5100.23 Safety Program audit checklist and workplace inspection checklist were verified and updated. A letter of clarification and applicability was provided for OPNAV M-5100.23 Section A.

- As members of the Joint Services Safety Council (JSSC) board, Code 20 participated in the JSSC's motor vehicle working group (MVWG), recommending updates to DODI 6055.04, DoD Traffic and Motor Vehicle Safety. The MVWG introduced Section 4, "Tactical Vehicle Safety," which was accepted by the JSSC and signed into effect by the OSD for Personnel and Readiness.

- The shore directorate led efforts in several high-level program and policy reviews at the O-6 and GS-15 level or higher. These included: DODI 6055.04, DODI 6055.05, DoDI 6055.12, SECNAVINST 5100.16D, USMC SMS Vol. 6, SOH MCO 5100.29C, OPNAVINST 11230.2B, OPNAVINST 5102.1E, and OPNAVINST 11240.8J CH-1.

SAFETY RISK MANAGEMENT

- The directorate also provided support to ensure the successful release of RMI by training, leading development of the supervisory report, feedback development and processing, and support to SPM development teams.

- Improvements for the Navy's Traffic Safety Program were initiated through the establishment of a High Velocity Outcome Task Force (HVOTF) for two-wheel, private motor vehicles (PMV-2). Supported by other Navy safety enterprise stakeholders, the HVOTF researched alternative training methods for motorcycle safety to educate Sailors, save lives, and reduce training costs.

- The shore safety director and deputy director presented "The Safety Case Model (System Approach to Risk Prioritization)" to the American Society of Safety Professionals annual safety conference, Sept. 14, 2021, in Austin, Texas.

- Code 20 staff played a key role in the development of the Major Fires Review report through data gathering and analysis for shipboard fires during availabilities.

- The directorate promulgated Navy COVID-19 reporting and recording guidance in accordance with OSHA requirements.

- Code 20 provided oversight for OSHA inspections at Naval Surface Warfare Center, Corona, California, USS McFaul (DDG 74), and Joint Base Pearl Harbor-Hickam, Hawaii.

SAFETY ASSURANCE

- The Shore Safety Directorate provided safety assurance support for NAVINSGEN and Naval Sea Systems Command (NAVSEA) inspections, working group support for various programs from the Defense Safety Oversight Committee to the Fleet Operational Safety Council, and multiple presentations and interactions including Professional Development Symposium (PDS) and Echelon II SOH groups.

- The Shore Safety Directorate provided SMEs to assist in the completion of numerous NAVINSGEN and NAVSEA audits. These audits were performed at various locations and lasted seven to 10 days. Completed audits included: Naval Postgraduate School; Director, Strategic Systems Program; Commander, Navy Reserve Forces Command; NAVSEA; Commander Pacific Fleet; Portsmouth Naval Shipyard; and Norfolk Naval Shipyard (NNSY).

- Coordinated and chaired several working groups including: RMI Functional Requirements and SPM modules, JSSC Motor Vehicle, JSSC Joint Tactical Vehicle, Navy PMV-2 HVOTF, SQC Hearing Conservation, Navy Gas-Free Engineer Board, and NAVSEA fire reporting.

- Shore Safety Directorate performed roundtable analysis and discussion for several mishap investigations. Final endorsements were submitted for USS Oscar Austin (DDG 79), NNSY Building 33, and USS Iwo Jima (LPH 2) fires.

- The shore directorate staff interacted and responded to fleet questions and issues. During CY21, individual staff members provided customer feedback support to 777 email queries.

SAFETY PROMOTION

- The shore safety team spearheaded the NAVSAFECEN's third line of effort (LOE), Safety Professional Development, which assessed and developed the competencies of safety professionals throughout the naval enterprise. This initiative redefined the standards of knowledge and skillsets for safety advocates and professionals to better align education and qualification requirements, thereby enhancing support to the naval enterprise.

    - A cross-functional team of senior warfare community safety representatives assembled to identify all safety advocate and professional positions across the naval enterprise in order to determine higher-level requirements linked to position competencies.

    - Through comparing other full-time and collateral duty personnel, benchmarking private industry training and conducting formal schoolhouse reviews, Code 20 provided recommendations and proposed changes to existing policy for safety professional development.

- In addition to the LOE milestone, Code 20 established the Navy Safety Professional Certificate Program and initiated the ongoing Level 1 pilot course. In 2021, 12 candidates successfully qualified for Safety Professional Level 1 credentials during the first two Safety Professional Certificate boards.

- The directorate hosted ISO 45001 training, which educated 15 NAVSAFECEN leaders on the gold standard for safety management systems. The training helped better align the Navy with private industry safety management and is being used to supplement NAVSAFECEN's second LOE, Risk Management Rebranding.

As the Navy's premier subject matter experts for safety:

- Participated in NAVSAFEVNTRACEN's PDS, providing presentations to bring information and training directly to the fleet. The presentations included "Creating a Motorcycle Mentorship Program," a case study titled "The Safety Case Model (System Approach to Risk Prioritization)" and best practices for "The Do's and Don'ts of Deficiency Writing." The staff also facilitated a Navy safety functional community manager's claimant meeting to review proposed and current policy changes affecting safety professionals.

- Additional presentations provided by the Shore Safety Directorate staff included "Warfare Centers Community of Practice" brief and "Type Commander's Safety Summit" brief.

- Chaired the Safety Quality Council and coordinated efforts to transition the meetings to Microsoft Flank Speed Teams to increase efficiency and productivity.

- Compiled the "Program Management Review (PMR) for the Navy Enterprise," depicting the "State of Navy Safety" for secretary of defense review.

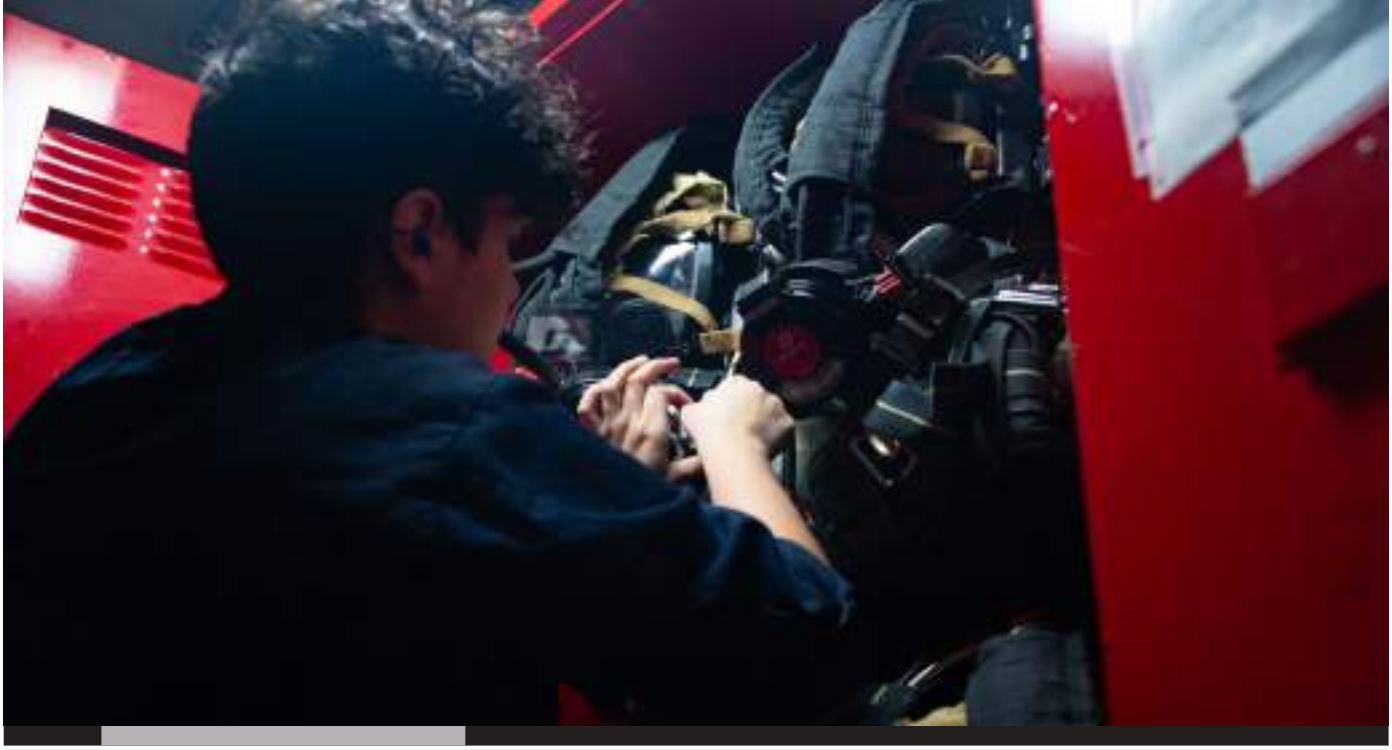
- Compiled and submitted to the OSHA and BLS annual reports to SECNAV detailing the Navy Safety Management Program status and accomplishments during fiscal and calendar year 2021.

- After consolidating and managing nominees for the CNO Shore Safety Award and GEICO Service Award, the directorate also established and named the awardees.

- Managed the GEICO Military Service Awards Program submissions for the Navy.

Released ALSAFEs

- ALSAFE 21-010 – Chief of Naval Operations (CNO) Safety Awards Program
- ALSAFE 21-009 – RMI SPM Inspections & Hazard Abatement Training Schedule
- ALSAFE 21-007 – GEICO Military Service Awards Program
- ALSAFE 21-006 – Establishment of 120-Day Extension of Motorcycle Rider Training Requirements (due to COVID-19 training restrictions)
- ALSAFE 21-005 – COMNAVSAFECEN Launches Motor Vehicle Safety Campaign
- ALSAFE 21-004 – RMI SIR Training Schedule
- ALSAFE 21-003 – FY2020 CNO Awards for Achievement in Safety Ashore
- ALSAFE 21-002 – RMI SIR Training Schedule



SME Analysis

- Indoor air quality (IAQ) open deficiency status – A significant number of IAQ deficiencies were left open across the enterprise beyond the required closure dates. Unresolved IAQ deficiencies increase the risk of airborne disease and could lead to significant health problems for employees in the buildings.

- Shore command comparison – There are disparities when comparing lost-time case rates and other information for similar commands. The Navy currently uses many systems to record and track civilian injuries and illnesses such as RMI, the ESAMS, shipyard systems, etc. Force Risk Reduction (FR2) is the only system within the DoD that contains information for all civilians in the naval enterprise. The information in FR2 comes from workers' compensation information obtained from the financial systems. Although workers' compensation is not a direct comparison to OSHA recordable injuries and illnesses, it does provide a means for holistic viewing across the enterprise. Analysis products compare FR2 data to mishap recording data to determine underreporting depth.

- Fall hazard assessment deficiencies not entered into ESAMS – Over the last five to seven years, more than 30 comprehensive fall hazard assessments funded by mishap prevention and hazard abatement program funds have been performed on various installations, facilities, afloat units, and buildings to the sum of over $10 million. This analysis project looked at over 30,000 fall hazards identified in these surveys and how they have been recorded, mitigated, or accepted.

- Self-contained breathing apparatus (SCBA) wearers not fit-tested afloat – Various afloat commands are not following manufacturer or National Fire Protection Association (NFPA) standards to fit-test users of SCBAs before use. An improperly fitting SCBA face mask can subject the wearer to poisonous gases and result in reduced longevity of the air tank due to excessive air escaping through the sides of the mask. The use of SCBAs is not unique to the military, and currently there is no CNO waiver that exempts naval enterprise personnel from being fit-tested before SCBA use. This analysis delves into why identified commands are not following manufacturer and regulatory requirements.

Occupational Safety and Health Safety Grams

- Updates on OSHA Shipyard Standards – OSHA recently updated Directives CPL 02-01-060, CPL 02-01-061, and CPL 02-00-162 that took effect March 22, 2019. These directives provide guidance to OSH professionals concerning OSHA's policies and procedures for implementing intervention and inspection programs to reduce or eliminate workplace hazards in shipyard employment, i.e., ship repair, shipbuilding, and shipbreaking. Furthermore, these directives provide current information and ensure the consistent enforcement of OSHA's shipyard employment standards (29 CFR Part 1915).

- Don't Let Confined Space Work Pin You In – The requirements governing confined space work can be found in different publications and differ depending on the entity performing the work and the location in which the work will be performed. With many different documents and requirements regulating the program, this has proven to be somewhat confusing for the end user. This OSH safety gram explains the requirements and provides guidance on which publications apply to a given situation.

- **Tag Out or Lock Out when Servicing Lathes** – There is a common misconception that servicing the chucks on manual lathes is covered under the OSHA minor servicing exemption and has been associated incorrectly with procedures for normal production operation lock outs or tag outs. This OSH Gram dispels this myth.

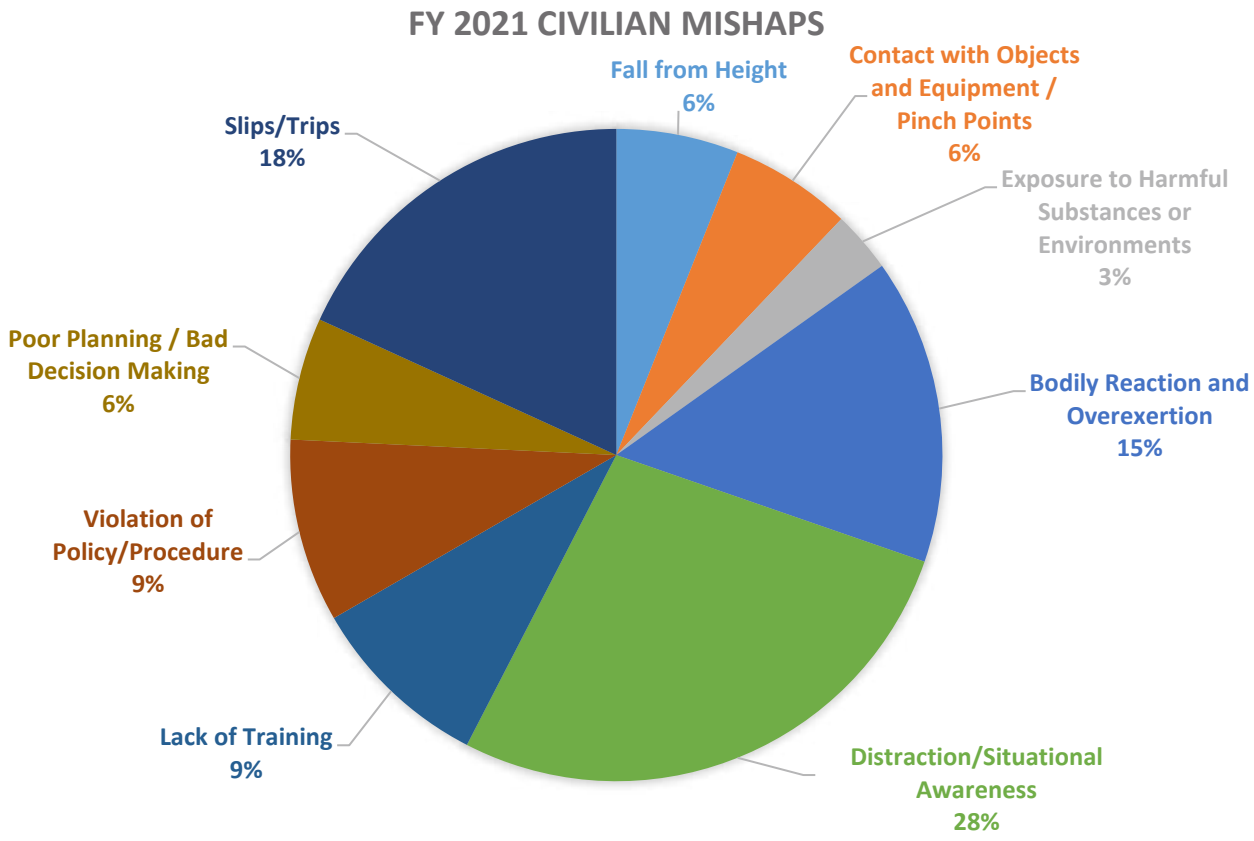
- **Common Electrical Panel Clearance Deficiencies**– A common deficiency during workplace inspections of various facilities is proper electrical panel clearances. Blocking or obstructing electrical panels presents two distinct hazards. The primary hazard is obstructing panel access for electrical isolation during emergencies. The secondary hazard is due to insufficient spacing around electrical panels, which causes overheating of the panel due to reduced airflow, resulting in increased potential for a fire. Regulations set by OSHA and NFPA require minimum clearances of objects to avoid these potential hazards.

- **Energized Work Permits** – Personnel may be performing energized testing, troubleshooting and voltage checks without first obtaining the proper authorization in the form of an energized work permit. During the 2020 Environmental, Safety and Health Managers Conference, it was brought to the attention of NAVSAFECEN personnel that OPNAV M-5100.23 does not allow energized work permit exemptions when performing testing, troubleshooting, or voltage checks. Personnel at various commands may be performing these tasks without the proper authorization in the form of a signed energized work permit. This OSH Gram explains the requirements for energized work.

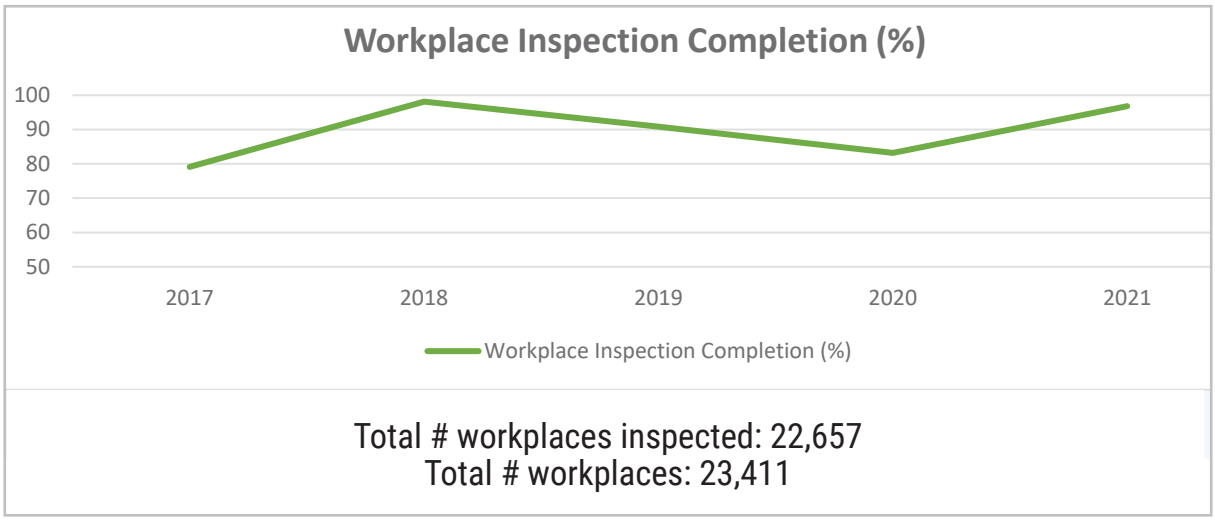
DON tracker tasks

During CY21, the Shore Safety Directorate managed and completed several DON tasks, including a BLS data call, Nationally Recognized Testing Laboratories fact-finding, HVOTF decision brief, OSHA Annual Report data call, SME request for RMI SPM Training Module Government Acceptance Testing (GAT), PMR and medical surveillance data call, OPNAV M-5100.23 CH-1 coordination, RMI SPM Training Demand Signal, LOE 21-03 fact-finding review, RMI SPM SME request for inspections/hazard abatement GAT, OPNAVINST 5100.27 update, RMI SIR2 training demand signal, RMI SPM Fall Protection module SME request, and SOH deficiency validation.

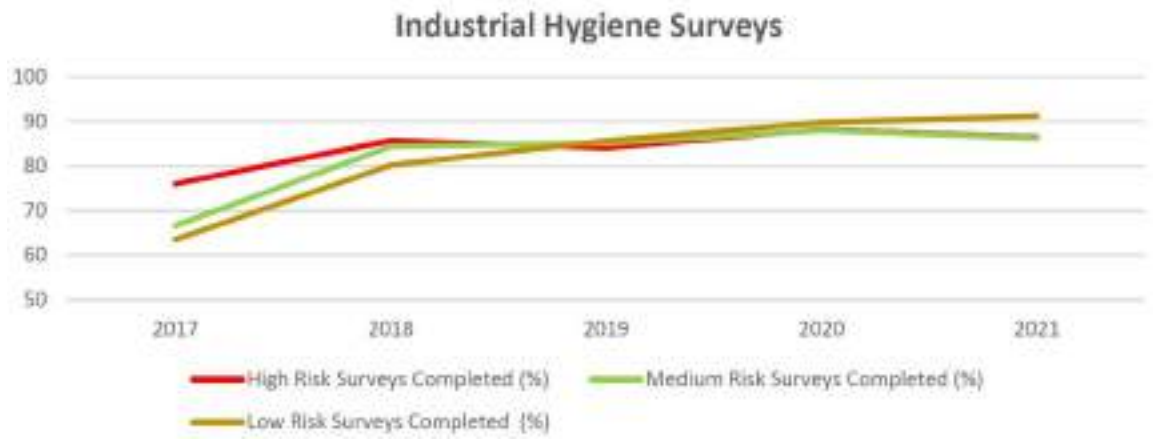
FY21 Shore Safety Mishap Summaries



Evaluation and Corrective Actions-Hazards

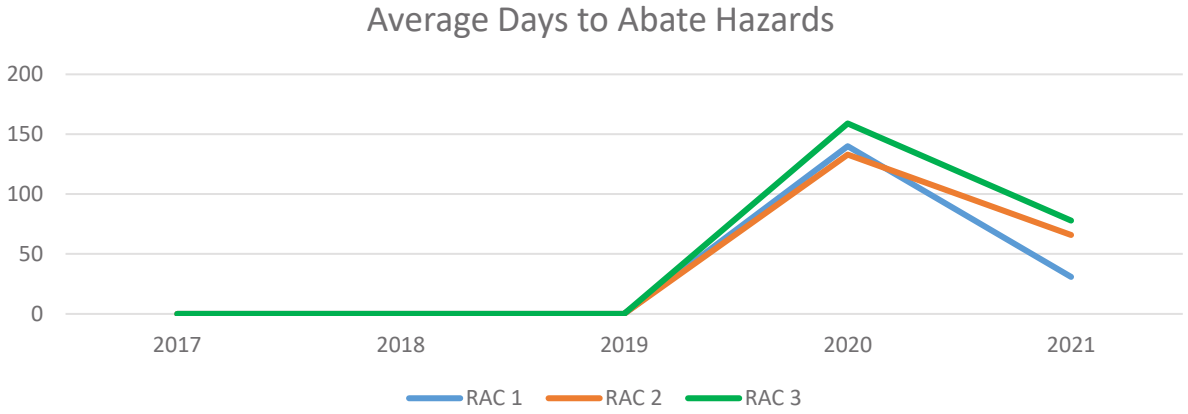


Total # workplaces inspected: 22,657
Total # workplaces: 23,411

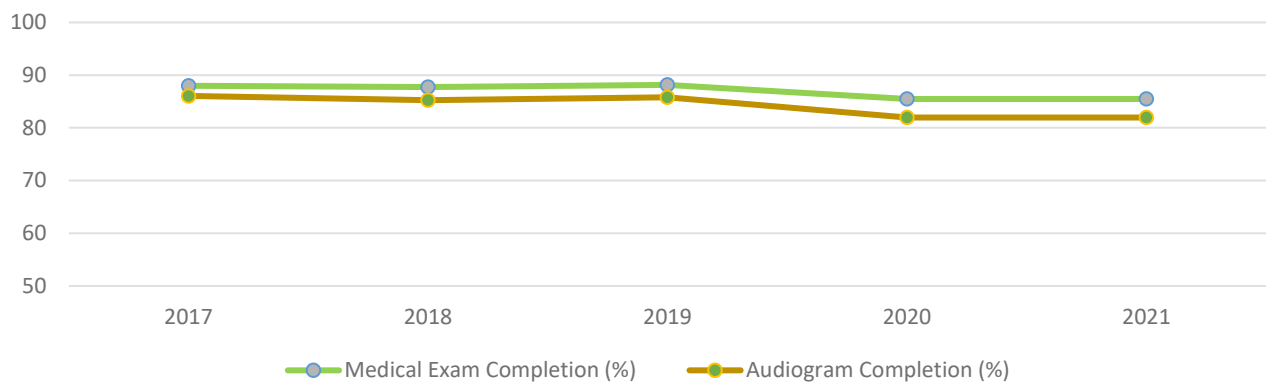


Shops	2,020
Total # of high-risk shops	1,514
High-risk surveys completed	1,309
Total # of medium-risk shops	18,391

Medium-risk surveys completed	15,865
Total # of low-risk shops	7,434
Low-risk surveys completed	6,782



Average days to abate	RAC 1 31	RAC 2 66	RAC 3 78



Medical exams and audiograms			
Total # of medical exams required	403,623	Total # of audiograms required	126,981
Total # medical exams provided	344,999	Total # of audiograms provided	104,072

APPENDIX C: CODE 30

AFLOAT SAFETY DIRECTORATE

About Us

The Afloat Safety Directorate (Code 30) plays a relevant role in preserving warfighting capabilities and combat lethality by identifying hazards and reducing risks to people and resources. Our subject matter experts (SME) offer more than 285 years of experience combined.

The Afloat Safety Directorate provides "around the clock" subject matter expertise to afloat commands about the Navy Safety and Occupational Health (SOH) program to include Afloat Operational Safety Assessments (AOSA), Risk Management Information Streamlined Incident Reporting (RMI SIR) support and quality control, training, and requests for information.

Afloat safety professionals work tirelessly to provide direct support and assistance to fleet units as delineated in the OPNAVINST 5100.19F Navy Safety and Occupational Health Program Manual for Forces Afloat.

The directorate assists the fleet in understanding safety policies and SOH requirements to maintain a safe and healthy working environment, not only for the ship, but also for Sailors. We provide fleet feedback on all afloat SOH-related questions. We train and certify submarine safety officers through Safety Officer Certification classes. We routinely engage with type commands (TYCOM) to discuss current trends, best practices, and ensure alignment with current policy and directives for the fleet.
Afloat Safety offers technical-assist visits (pierside) and underway AOSAs. During the visits, we not only look at the safety programmatic, evolutions, and day-to-day operations, but we also meet with all program managers and provide training and guidance on how to improve their programs.

Our best information comes from Sailors during underway assessments. By observing Sailors during their evolutions, day-to-day tasks, and conducting interviews it helps us better understand the safety culture.

The directorate maintains stewardship of all open mishap recommendations (MISREC) and corrective actions, which includes continuous development and streamlining of a structured process to adjudicate outstanding risks identified by the fleet. This assists action commands with proper prioritization of MISRECs, fosters a steady strain to resolve them, and plays a vital role in the reduction of future mishaps.

With all the data collected from the assessments, mishaps, and near-miss reports, our team analyzes the data to quickly identify trends, areas of risk, and common factors that lead to mishaps. We further develop Safety Promotion material for the fleet such as articles, safety messages, Lessons Learned (LL), and Safety Assurance Letters. We provide our findings and recommendations to identify, educate, and discuss risk mitigation and mishap prevention.

2021 Overview

- Over this past year, we continued provision of RMI SIR training and conducted quality assurance (QA) for all safety reporting. We furthered development of the "Fall Protection" (FP) policy and training, implemented new measures to improve mishap recommendation stewardship, and conducted AOSAs for afloat units.
- Additionally, following USS Bonhomme Richard's (LHD 6) fire, we played a major role as the NAVSAFECEN completed a comprehensive historical review of major fires aboard U.S. Navy ships.
- In response to challenges presented in 2021, Code 33 (Submarines) adapted the Submarine Safety Officer course to a virtual setting to ensure availability to all submarine concentration areas simultaneously.
- Finally, we continued to provide sound safety guidance to the fleet, answering all safety-related inquiries, and providing comprehensive trend analysis to deploying expeditionary and strike groups.

SAFETY POLICY AND SAFETY RISK MANAGEMENT

RMI SIR Training and Guidance

Following the development and release of RMI SIR in 2020, Code 30's 2021 priorities were to ensure a seamless transition from the Web-Enabled Safety System (WESS) to RMI, and continue to train the naval enterprise on its use.

- Additional training to the fleet was required for RMI SIR this year since its release last August. This additional training included the delivery of over 60 hours of online training to over 150 Navy and Marine safety professionals through Adobe Connect.
- As the afloat subject matter experts, Code 30 was also responsible for quality control of over 2,000 afloat mishap and incident reports ensuring accuracy of all data for current data analysis and historical recordkeeping purposes.
- The afloat safety team responded to 200 fleet safety inquiries.

Fall Protection (FP) Program

- 2021 yielded the continued development of FP policy and training. Despite the challenging conditions presented by COVID-19, the FP training program continued to gain momentum following implementation of the new DON Fall Protection Guide through the continued deployment online training for Afloat Competent Persons. Online meetings with Commander Naval Air Forces (CNAP), the U.S. Coast Guard, and Military Sealift Command FP representatives helped solidify policy continuity across all communities.

Submarine Safety Officer Course

- With COVID-19 challenges continuing in 2021, Code 33 continued to offer the Submarine Safety Officer course in a virtual setting, which made the course available to all submarine concentration areas simultaneously. This continuation of training resulted in over 75% increased attendance per course, more than double the increase following the first virtual offering in 2020.
- The course provided instruction on mishap investigation and reporting, hazard reporting, trend analysis, operational risk management, occupational safety, NAVSAFECEN reporting tools and services, recreational and off-duty safety, traffic and motorcycle safety, and lessons learned from fleet mishaps and AOSAs. Over six course cycles, 80 students successfully graduated and were certified as safety officers aboard submarines.

SAFETY ASSURANCE

Following USS Bonhomme Richard's (LHD 6) (BHR) fire, the Afloat Safety Directorate played a major role as the NAVSAFECEN completed the Major Fires Review (MFR), a comprehensive historical review of major fires aboard U.S. Navy ships. In their analysis, NAVSAFECEN identified multiple recurring trends in the causal factors in 15 shipboard major fire-related events over a 12-year period that culminated with the BHR fire.

The afloat safety team, along with the Shore Safety and Knowledge Management and Safety Promotions Directorates, Naval Sea Systems Command (NAVSEA), and U.S. Fleet Forces Command, provided support and assistance to the VCNO's Navy Fire Culture Project. The Navy Fire Culture Project evolved from the MFR board, and focused on the cultural issues related to fires fleet-wide occurring underway, and during private and public availabilities.

MISREC Stewardship

During 2021, the NAVSAFECEN requested an outside look at our MISREC and hazard report closeout process by the Naval Audit Service. This audit energized stewardship and identified key parts of our process for improved adjudication of outstanding risks to the fleet.

- The result was a successful closeout of 61% of the MISRECs that existed in January 2021. These enriched processes are enduring and will require consistent effort to ensure that we continue to properly categorize and track MISRECs going forward.
- The afloat safety team closed 110 MISRECs in 2021 and provided final endorsements for six Class A Mishap Safety Investigations.

Afloat Operations Safety Assessments (AOSA)

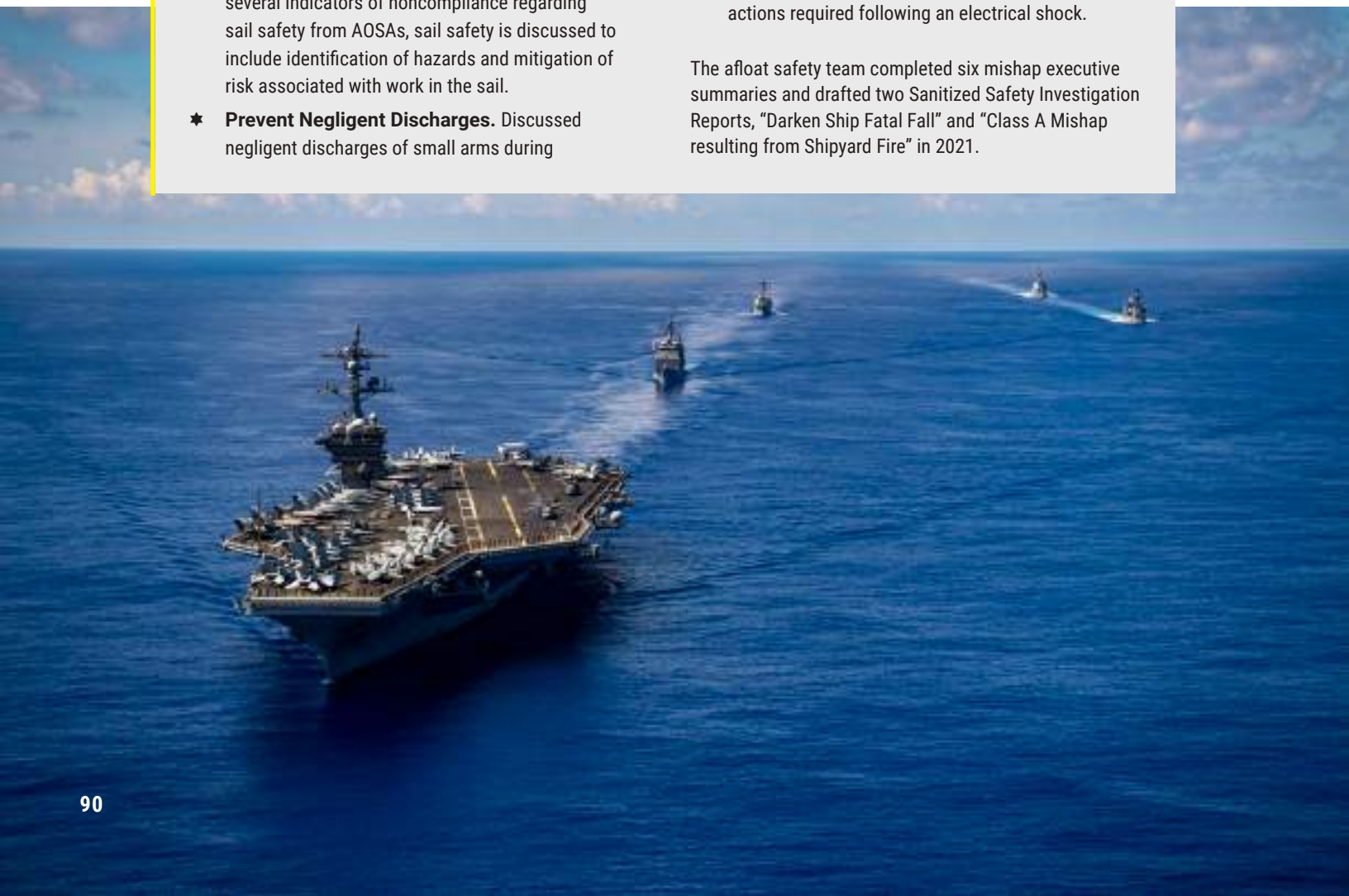
- 2021 brought continued travel challenges in conducting the underway AOSA as a predictable part of the deploying group's (carrier or expeditionary strike group) Optimized Fleet Response Plan (OFRP).
- Persevering through COVID restrictions, our team completed eight assessments, including comprehensive events for USS Gerald R. Ford (CVN 78), USS Tripoli (LHA 7), USS Makin Island (LHD 8), USS Gunston Hall (LSD 44) and three guided missile destroyers (DDGs). These events provided key insights to the commanding officers and strike group commanders.
- During these assessments, our teams observed watch standers on the bridge, in the Combat Information Centers (CIC), on the foc'sle or refueling stations, and in engineering spaces while the ships conducted normal operations and various special evolutions. The assessments provided insight to the commanding officers (CO) on how well Sailors were incorporating safety on the deckplates, developed a picture of how the unit actually valued safety, and gained understanding of the unit's level of knowledge and any impediments to safety. There was emphasis placed on identification of indicators of common causal factors learned from historical surface ship mishaps. Our feedback, paired with predictive analysis, helped identify and address specific areas of safety concern and played an important role in the reduction of future mishaps.

SAFETY PROMOTION

Factual Lines About Submarine Mishaps

- **Awareness of Head Space.** Discussed head injuries on submarines including mishaps occurring in CY20/21, lessons learned, best practices, and risk mitigation methods.
- **Sail Safety for Maintenance Periods.** After several indicators of noncompliance regarding sail safety from AOSAs, sail safety is discussed to include identification of hazards and mitigation of risk associated with work in the sail.
- **Prevent Negligent Discharges.** Discussed negligent discharges of small arms during associated preventive maintenance, as most mishaps occur during maintenance. Reinforces needed supervisory involvement and operator responsibilities.
- **Don't Be Shocked.** With over 51 mishaps involving personnel being shocked for the year, this article discussed lessons learned, hazard identification, actions required following an electrical shock.

The afloat safety team completed six mishap executive summaries and drafted two Sanitized Safety Investigation Reports, "Darken Ship Fatal Fall" and "Class A Mishap resulting from Shipyard Fire" in 2021.



FY 2021 AFLOAT SAFETY MISHAP TREND SUMMARIES

Data Construct: During 2021, the Navy continued many first-of-its-kind evolutions to respond to the global COVID-19 pandemic, which affected every facet of fleet operations. The NAVSAFECEN also continued to experience the effects of change in mishap reporting methodologies lingering from the transition from the legacy WESS to RMI reporting systems. To maintain data integrity throughout the subsequent convergence of data, Code 30 performed a "line-by-line" analysis of this year's data to ensure inconsistencies between reported mishap category and mishap narrative were taken into account throughout the analysis period, Oct. 1, 2019 to Sept. 30, 2021. As a result, the following figures are provided to the fleet:

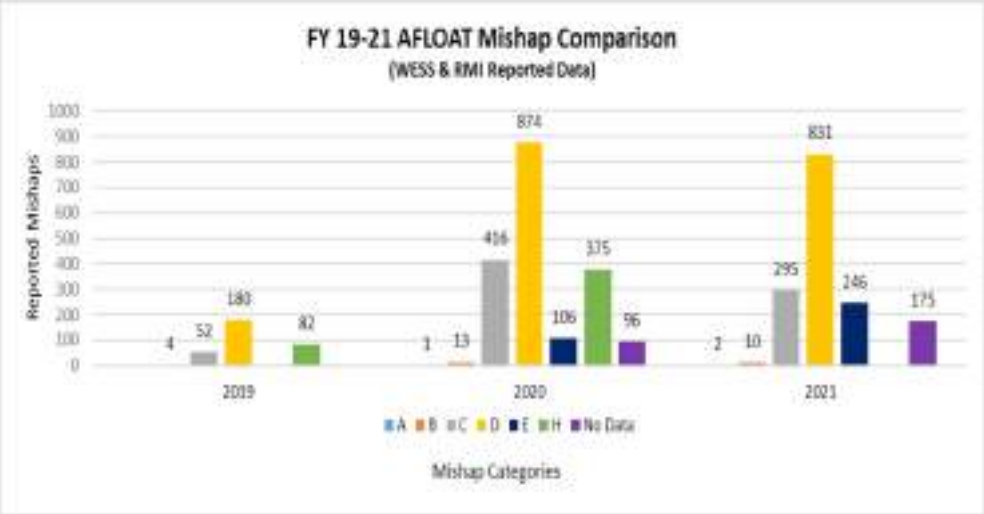


Figure 1. Reported Afloat Mishap Data, FY19-21.

FY19-21 Mishap Data Analysis. Figure 1 depicts 3,758 reported Afloat mishaps between FY19-21. There were three Class A mishaps (two experienced in 2021), 27 Class B mishaps (10 experienced in 2021), 763 Class C mishaps (295 experienced in 2021), and 1,885 Class D mishaps (831 experienced in 2021).

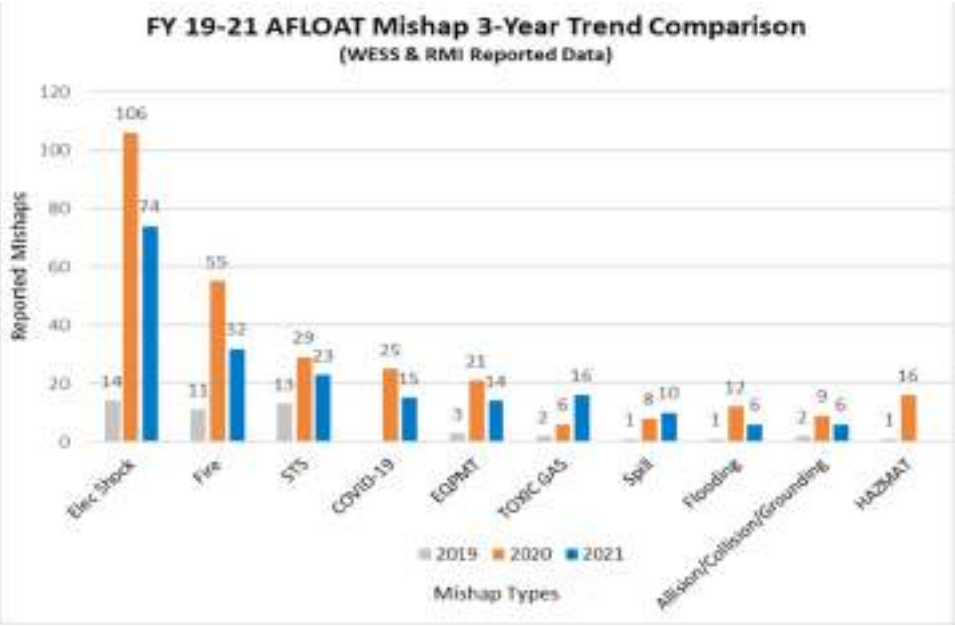


Figure 2. Afloat Mishap Three-Year Trend Comparison, FY19-21.

There were 531 reported afloat mishaps between FY19-21. Leading these trends were electrical mishaps at 194 (74 experienced in 2021).

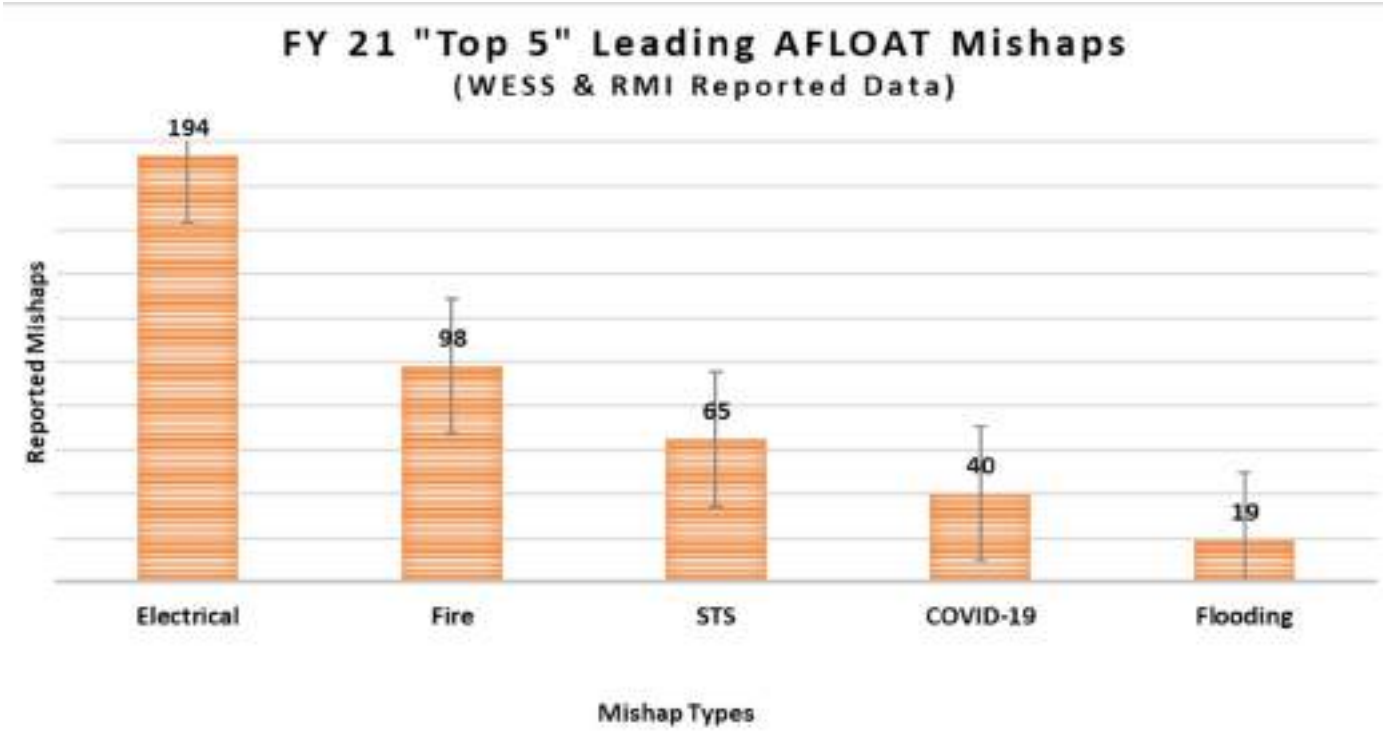


Figure 3. FY21 "Top 5" reported afloat mishaps.

Figure 3 focuses on the "Top 5" reported mishaps. Of these, there were 416 reported mishaps in FY21 (64% of total reported mishaps). Although the Delta and Omicron variants were not reported, mishaps due to the COVID-19 pandemic are depicted.

FY21 "Grade Cards"

In this next section, the following data are broken out by combined ship class and type, and mishap categories Class A-D reported. These data are presented to compare to fleet averages, and highlight reported trends for "in-class" aboard safety professionals:

Aircraft Carrier Vessels (CVN)

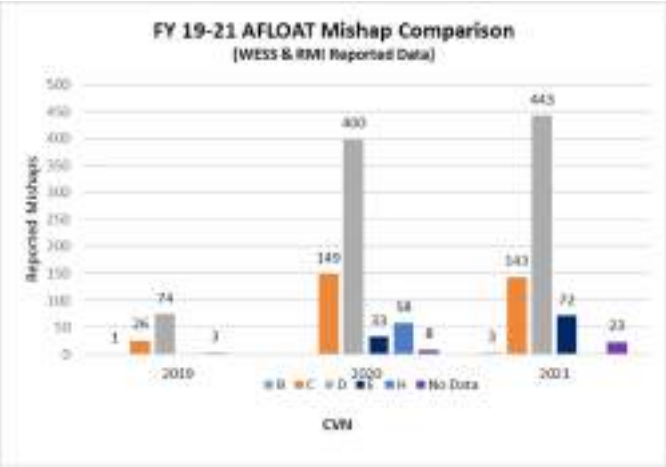


Figure 4. The FY19-21 CVN Mishap Spectrum

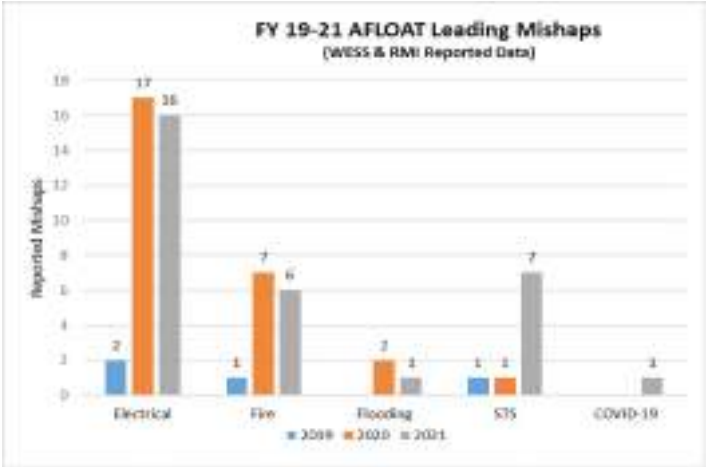


Figure 5. The FY19-21 CVN Mishap Spectrum

Ticonderoga Class Guided Missile Cruisers (CG)

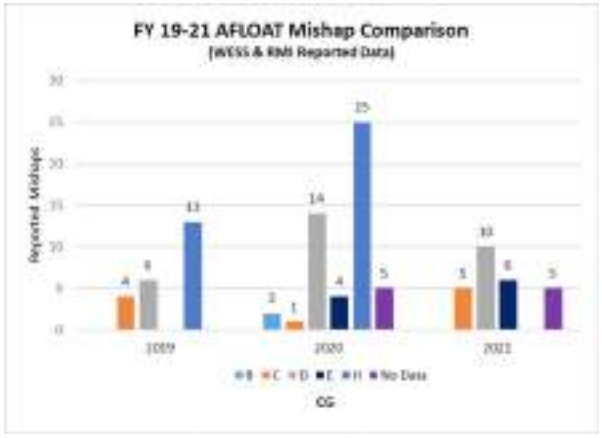


Figure 6. The FY19-21 CG Mishap Spectrum

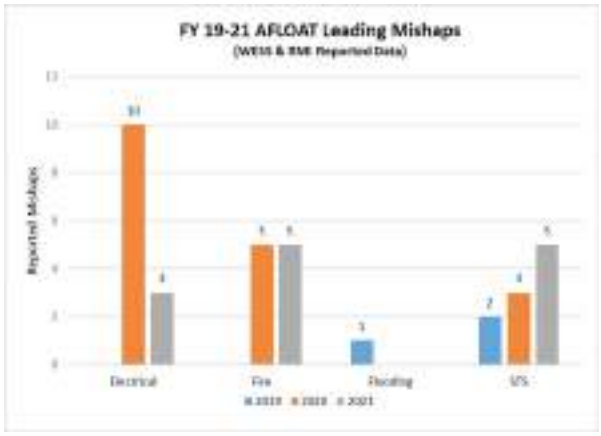


Figure 7. The FY19-21 CG Mishap Spectrum

Arleigh-Burke Class Guided Missile Destroyers (DDG)

Figure 8. The FY19-21 DDG Mishap Spectrum

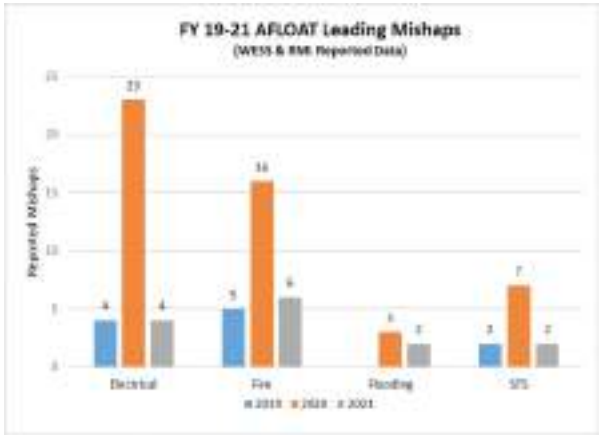


Figure 9. The FY19-21 DDG Mishap Spectrum

Blue Ridge Class Amphibious Command Ship (LCC)

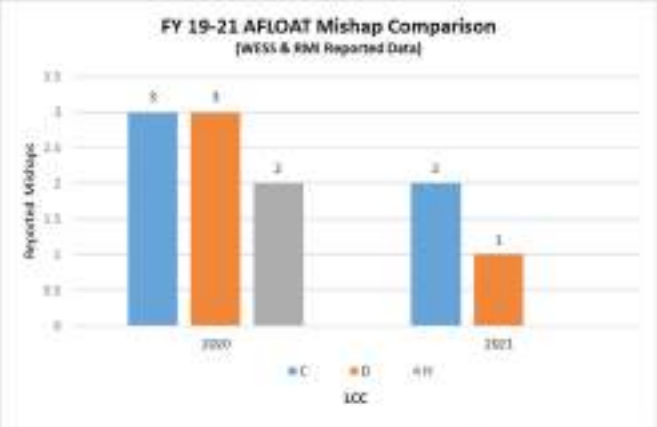


Figure 10. The FY19-21 LCC Mishap Spectrum

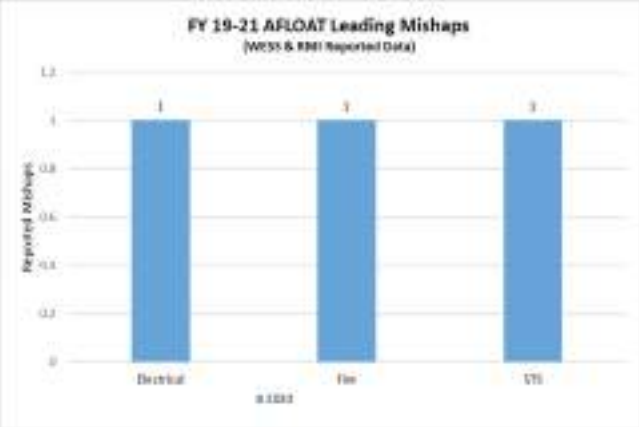


Figure 11. The FY19-21 LCC Mishap Spectrum

Littoral Combat Ship (LCS)

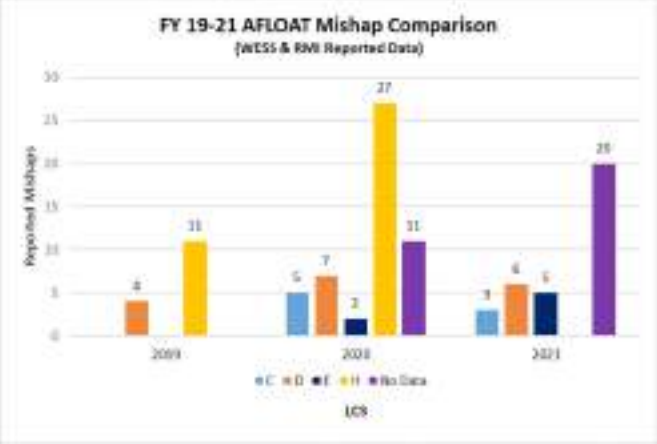


Figure 12. The FY 19-21 LCS Mishap Spectrum

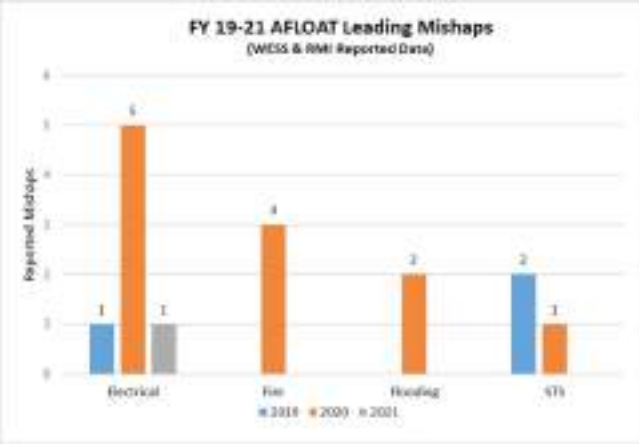


Figure 13. The FY19-21 LCS Mishap Spectrum

Amphibious Assault Ship (LHA/LHD)

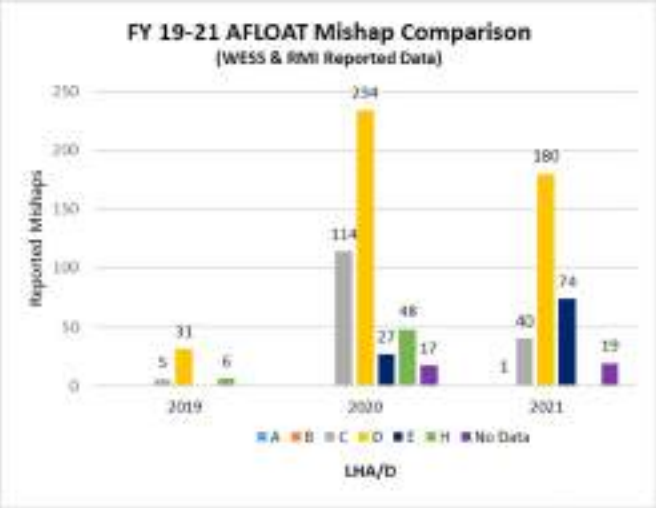


Figure 14. The FY19-21 LHA/LHD Mishap Spectrum

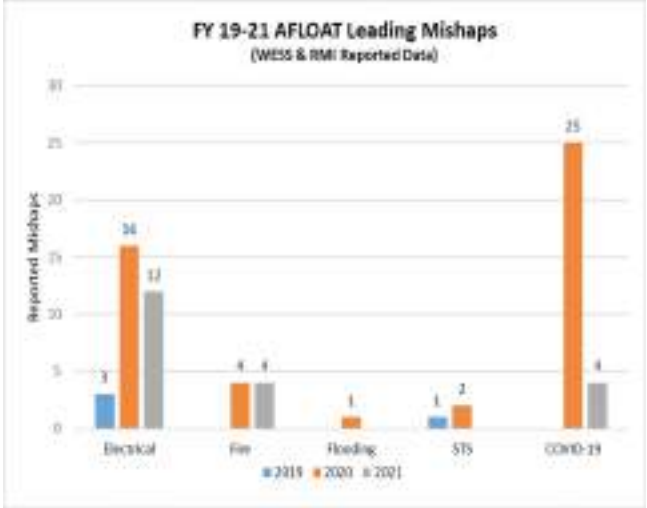


Figure 15. The FY19-21 LHA/LHD Mishap Spectrum

Amphibious Transport- Landing Platform / Dock Landing Ship (LPD/LSD)

Hull/Types Combined for 2021 Report

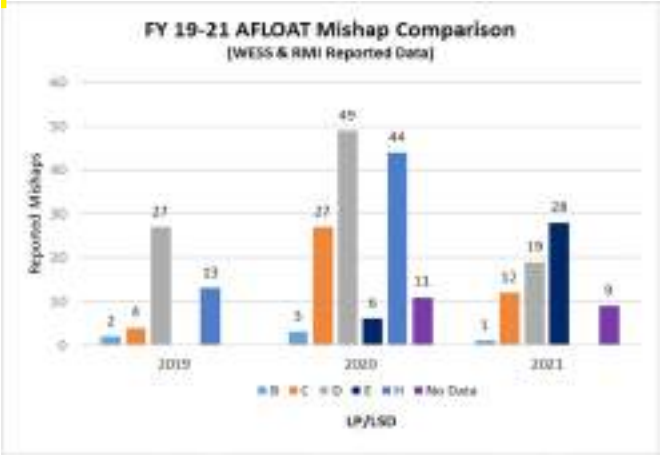


Figure 16. The FY19-21 LP/LSD Mishap Spectrum

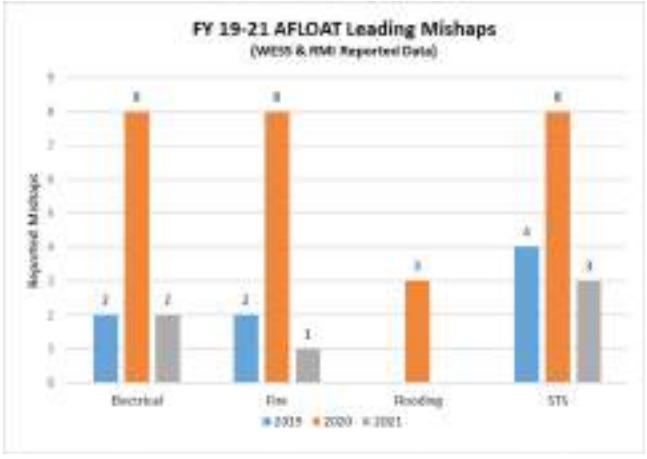


Figure 17. The FY19-21 LP/LSD Mishap Spectrum

Avenger-Class Mine Countermeasures Ship (MCM)

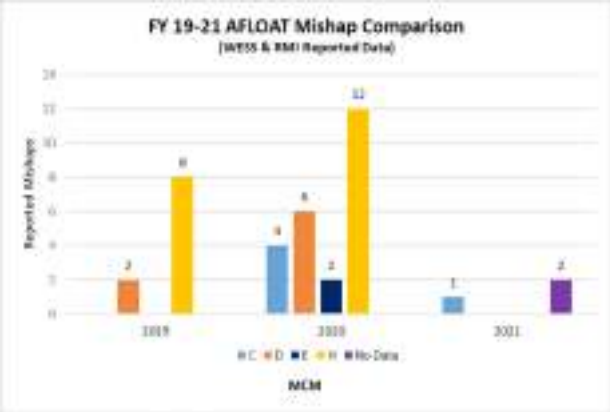


Figure 18. The FY19-21 MCM Mishap Spectrum

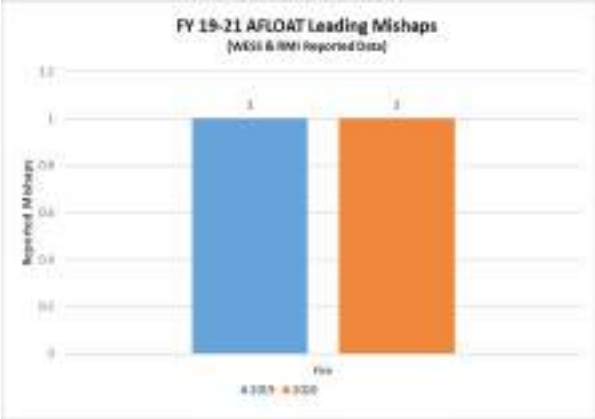


Figure 19. The FY19-21 MCM Mishap Spectrum

Cyclone Class Patrol Ship (PC)

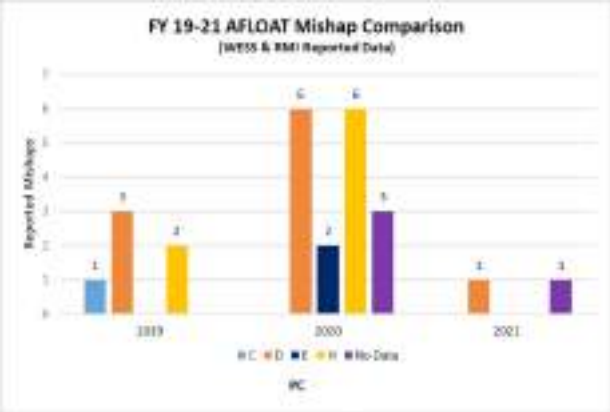


Figure 20. The FY19-21 PC Mishap Spectrum

Figure 21. The FY19-21 PC Mishap Spectrum

Ballistic Missile Submarine /Guided Missile/Nuclear) (SSBN/SSGN)

Hull/Types Combined for 2021 Report

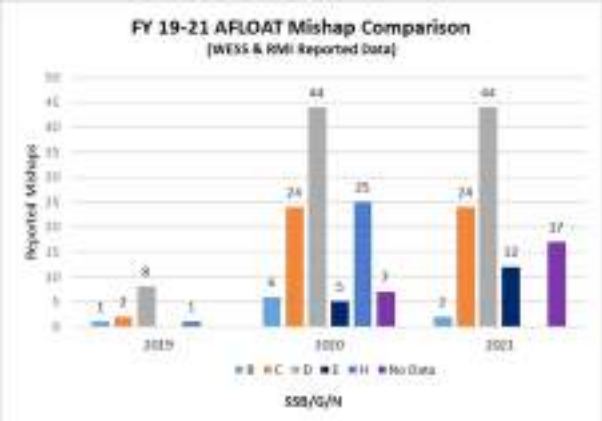


Figure 22. The FY19-21 (SSBN/SSGN) Mishap Spectrum

Figure 23. The FY19-21 (SSBN/SSGN) Mishap Spectrum

Fast Attack Submarine (SSN)

Figure 24. The FY19-21 SSN Mishap Spectrum

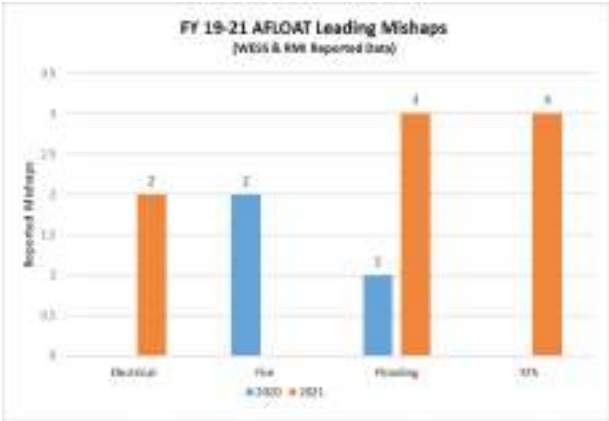


Figure 25. The FY19-21 SSN Mishap Spectrum

Military Sealift Command Ship (MSC)

Hull/Types Combined for 2021 Report

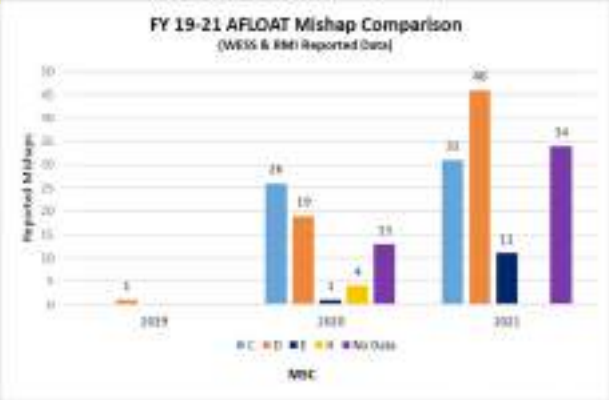


Figure 26. The FY19-21 MSC Mishap Spectrum

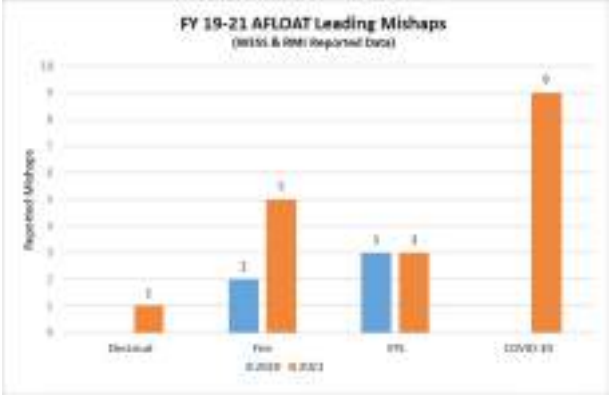


Figure 27. The FY19-21 MSC Mishap Spectrum

Small Craft

Small Craft Combined for 2021 Report

Figure 28. The FY19-21 Small Craft Mishap Spectrum

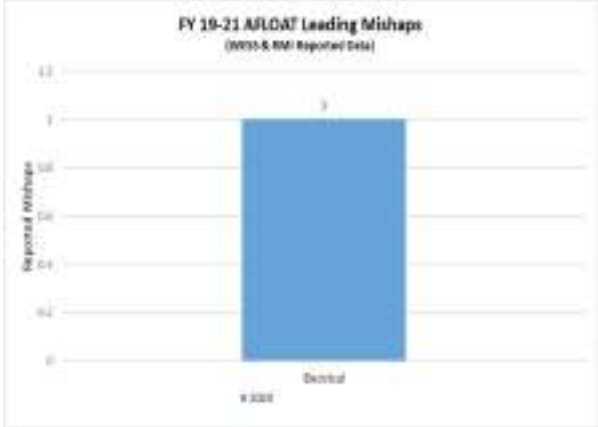


Figure 29. The FY19-21 Small Craft Mishap Spectrum

High-Level Metrics

Figure 30 illustrates a high-level analysis of the "Top 3" largest increases of mishaps for all afloat units. Commanders and Safety Officers of these hull/types should investigate the causal factors behind this negative trend analysis and implement mitigation efforts.

"Top Three" Hull/Types with Largest Mishap Increases

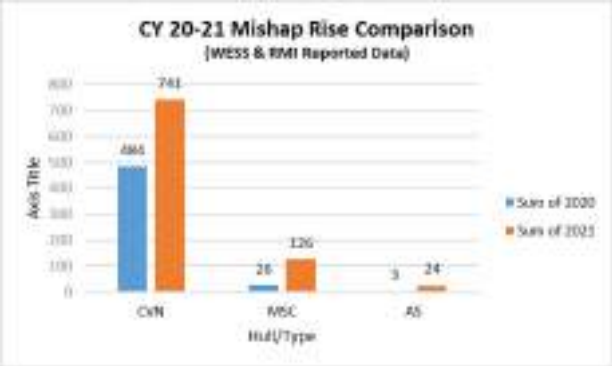


Figure 30. Comparison analysis of the top three hull/types with largest mishap increases.

Improved Stewardship of Mishap Recommendations

A major Code 30 initiative in CY21 was to improve internal and external communications to further develop synergy between afloat safety efforts and others within the NAVSAFECEN, while also deepening our relationship with surface and sub-surface TYCOMs and other external stakeholders. This initiative produced improved stewardship of all afloat MISRECs and better communication of our MISREC status resulting in an increased understanding of risks and appropriate mitigations by all stakeholders.

MISREC Status	Class	A	B	C	D	E	Totals
No Data (Note: 1)			77	1443	3714	2060	7294
In Work		95	10	178	586	269	1098
In Coordination				1	8	10	19
Closed		110	1	38	183	85	417
Awaiting Approval				3	9	11	23
Totals		205	88	1663	4460	2435	8851

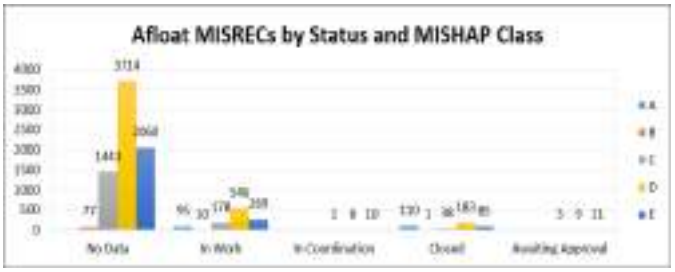


Figure 31. Afloat MISRECs by status and Mishap Class (Note 1: No data due to incompatibility or introduction of new required fields in RMI during transition from WESS reporting.)

Reflections

Safety remains a participative partnership, from the NAVSAFECEN to the fleet unit. While reporting a single mishap may seem to be a chore, no one knows where the "cumulative effect" of ALL of our safety reporting is going to lead, or benefit our ability to maintain our operational readiness and lethality. However, no matter the type of ships, the operating environments, the myriad amount of missions we are supporting and completing, or the rate, rank, or gender… there is a single most important aspect of our safety reporting that remains constant: ***"…the quality of our analysis is dependent on the quality of our reporting…"***

Recommendations

1. Recommend ALL UNITS take the time to characterize injury reports correctly, utilizing all available guidance. Clearly, if first aid has been provided to resuscitate one of our shipmates, the report is no longer a Class "No Data" report.
2. Similarly, rarely when mishaps occur is there "zero cost" to the U.S. Government. By their very nature, fires, flooding, collisions, allisions, and equipment failures cost money and man-hours to de-escalate, clean up after, correct, fix, and restore to normal. By not documenting these occurrences correctly, we not only impair our ability to do fleet analysis, but we also obscure potentially hazards trends that – with a safety awareness – could benefit YOUR safety, and your ship's safety.

The NAVSAFECEN will continue our collaborative efforts with the fleet to assure proper and effective accountability of safety and risk management across the naval enterprise to preserve combat readiness and save lives.

APPENDIX D: CODE 40

EXPEDITIONARY WARFARE SAFETY DIRECTORATE

About Us

The Expeditionary Warfare Safety Directorate (Code 40) provides assessments and statistical trend analysis based upon safety climate surveys identifying six areas of a safety culture: communication, leadership, knowledge, involvement, resources, and reporting.

2021 Overview

The Expeditionary Warfare Safety Directorate experienced continual challenges due to COVID-19. However, over the calendar year Code 40 accomplished more of its business in 2021, than it did over CY20.

Some of this business included conducting assessments such as Navy and U.S. Marine Corps (USMC) Airborne Safety Assessments, Diving Safety Assessments (DSA), Expeditionary Operational Safety Assessments (EOSA), and Risk Management (RM) assessments.

These assessments helped identify areas of unmitigated risk to an organization as it relates to risk to mission and risk to force. Additionally, these assessments helped ensure the organization understands who can accept that risk within the command, or when and how to elevate it to the next level in the chain of command. Finally, we became better stewards of all expeditionary mishap and hazard recommendations.

SAFETY POLICY

✪ Helicopter Rope Suspension Techniques (HRST) Tower Certification/Inspections

The Expeditionary Warfare Directorate helped maintain awareness of the need for an updated Naval Facilities Engineering Systems Command (NAVFAC) instruction ensuring all tactical and HRST towers were included for specialized inspection and certification. After years of dialogue with NAVFAC, OPNAVINST 11230.2C - Inspection, Certification and Audit of Navy Specialized Infrastructure instruction was signed. This instruction gives NAVFAC inspection ownership of all tactical and HRST towers, and assigns them the administration of the Specialized Infrastructure Inspection Program for the CNO as the DON authority for construction and facility engineering programs, including technical and management authority, life-cycle management and in-service engineering.

SAFETY RISK MANAGEMENT

✪ Pulse Scans

The Pulse Scan method is an innovative, narrative-based research tool that gives unbiased feedback of happenings at the command level. The narrative is a free thought, written story, and from that, the analysis conducted by NAVSAFECEN personnel generates actionable insights and guides command interventions. The Pulse Scan method provides an approach to capture, analyze, and identify command behaviors and leading indicators previously uncaptured through traditional measures such as safety reports or assurance visits. This method enhances leadership's ability to identify risk factors, promote awareness, and enable targeted risk mitigations along with corrective actions.

- USS Dwight D. Eisenhower (CVN 69), Feb. 15, 2021
- Naval Station Norfolk Security Department, Oct. 19-21, 2021

✪ Dive/Jump Reporting System

The Dive/Jump Reporting System (DJRS) migration from the Web-Enabled Safety System (WESS) to Risk Management Information (RMI) continued in 2021. The added versatility of RMI provides a more robust search capability for end users around the fleet. The new online web-based interface proved to be challenging for many users throughout all branches of the military. Directorate personnel provided needed training to the fleet regarding the DJRS functionality. They provided assistance with DJRS interoperability with RMI and U.S. Army interface for reporting. Due to U.S. military units located around the globe residing in multiple time zones, coupled with the challenge of a worldwide pandemic, Expeditionary Warfare Safety Directorate personnel found themselves providing technical assistance and training on the new DJRS interface at almost all hours of the day.

✪ Risk Management Rebranding

During the process of rewriting the Operational Risk Management (ORM) instruction, the Expeditionary Warfare Safety Directorate took the current ORM concept and reimagined a better way forward in identifying, adjudicating, and mitigating risk at all levels and activities, not just to the "operational" side. The current ORM model does not effectively manage risk at the appropriate level. Part of this restructuring involved receiving input from the fleet in the form of virtual focus groups within various areas of the naval enterprise (e.g., Afloat, Aviation, Shore, Expeditionary, etc.). These focus groups drew upon fleet operators' perspectives regarding their roles and application of risk management, which provided a wealth of knowledge in guiding the way forward. The directorate is taking this restructuring and reinvigorating concept and will feed it into the risk management portion of the new Navy Safety Management System (SMS) as we move forward with that initiative.

SAFETY ASSURANCE

✪ Expeditionary Operational Safety Assessments (EOSA)

Completed two EOSAs on Navy Expeditionary Combat Commands (NECC): Naval Mobile Construction Battalion 133 and Mobile Dive and Salvage Unit TWO. The assessment teams looked at the commands' risk management and safety culture as related to day-to-day operations and observed the use of critical thinking and decision-making related to risk management.

✪ Airborne Safety Assessments (ASA)

- **Navy**: Code 40 conducted eight assessments in CY21 (one at the Center for Naval Aviation Technical Training, three at NECC, and four at Naval Special Warfare (NSW)). These CNO-directed safety assessments looked at the commands' risk management for maintenance and operations as it related to the Navy Airborne Operations Program. The assessment team ensured safe, effective, and efficient maintenance practices were being followed. The team also observed the use of critical thinking, decision-making, and communication during personnel and equipment airborne operations. These assessments identified lack of compliance with type command (TYCOM) policies and lack of training for senior-level Special Operations Parachute Riggers (773A) when returning to the expeditionary community from an operational fleet tour.

- **Marine Corps**: Five parachute and Helicopter Rope Suspension Techniques (HRST) safety program inspections were conducted in 2021: three at Marine Expeditionary Force, and two at U.S. Marine Corps Forces Reserve. Marine Corps Order (MCO) 3120.11A and MCO 3500.42C mandate inspections are conducted every two years to assess the command's risk management for maintenance and operations related to the parachute and HRST Program. The assessment team ensured safe, effective, and efficient maintenance practices were being followed. The team also observed the use of critical thinking, decision-making, and communication during personnel and equipment airborne and HRST operations. These inspections identified facility shortfalls and administrative requirements that were not followed per Marine Corps orders.

✪ Diving Safety Assessments (DSA)

Diving Safety Assessments are a tool available to all Navy diving commands, and provide a third-party look at the administrative programs required to maintain a diving capability safely. In June 2021, a policy update was implemented, allowing commands to extend their operational certification by completing a DSA. Requesting and completing one- or two-day DSAs, conducted by Code 40's Diving Division (Code 42), can extend an operational certification by up to 15 months. This extension provides much-needed flexibility to the type commanders and commodores while ensuring the highest state of diving readiness. Demanding operational tempos, common throughout the military and compounded by manning and equipment short-falls, do not allow enough time for more frequent operational inspections, which directly impacts diving safety. The specific details of the program changes are outlined in the OPNAVINST 3150.27 series.

- Code 42 conducted 43 DSAs in 2021. This number is lower than pre-COVID-19 years, but higher than in 2020. With the newly revised OPNAVINST 3150.27, which allowed the extension of the operational inspection, coupled with the implementation of the first Commander, Submarine Force Atlantic and Commander, Submarine Force Pacific Joint Diving Instruction, the NAVSAFECEN should continue to see a rise in requests for DSAs from the fleet.

- Following the memorandum of agreement between the Navy and the Coast Guard (USCG) dated May 27, 2016, the NAVSAFECEN is responsible for conducting Diving Operational Readiness Inspections (DORI) for all USCG diving units. In 2021, Code 42 conducted three DORIs on USCG diving commands.

✪ Risk Management Assessments

As the Risk Management (RM) program manager, Code 40 coordinated with and assisted assessment and evaluation commands and activities to develop RM evaluation solutions to standardize staff RM evaluation training for fleet, shore, and support organizations. The staff also provided course curriculum managers and other formal training commands with specific guidance and content regarding curriculum requirements supporting the execution of risk and hazardous event decision-making training consistent with Sailor positional and career development. To meet this requirement, the Code 40 audited the following schools' commands:

- U.S. Naval Academy
- Surface Warfare Officer School
- Advanced Submarine Warfare Officer School
- Aviation Safety Officer School
- Naval Safety and Environmental Training Center

Due to COVID-19 and Navy deployment schedules, the Expeditionary Warfare Directorate could not perform any on-site assessments with evaluation commands.

✪ Culture Workshop Assistance

The NAVSAFECEN serves as the program manager for the Culture Workshop (CW) Program. The NAVSAFECEN is called upon to conduct CWs during short-fused matters or to assist with significant Navy concerns. The CWs give commanding officers a snapshot of their unit's culture. This snapshot is developed by trained facilitators who carefully listen to unit members. The workshops identify potential hazards that might interfere with mission accomplishment. They also identify command strengths. Using the workshop findings, unit leaders can better focus on those areas requiring risk assessment and risk controls. The ultimate goal is operational excellence and the development of positive behaviors that contribute to warfighting success. The Expeditionary Warfare Directorate assisted with conducting CWs for the following organizations:

- USS Gerald R. Ford (CVN 78)
- USS Dwight D. Eisenhower (CVN 69)
- Security Department, Naval Station Norfolk, Virginia
- NAS Meridian, Mississippi
- NAS Corpus Christi, Texas

✪ Investigation Assistance

The directorate provided a military subject matter expert (SME)/investigator for participation in a safety investigation board for a mishap involving a Seabee petty officer who died in a highway convoy accident when the trailer detached and impacted the cab after being rear-ended. One of the mishap recommendations from the event resulted in changes to instructions that will greatly improve the safety of future operations throughout the NECC. Additionally, NAVSAFECEN provided two military SMEs/investigators for participation on a safety investigation board for a mishap involving fast rope operations.

✪ Mishap Endorsement

The Expeditionary Warfare Directorate also endorsed the mishap referenced above.

SAFETY ASSURANCE, Cont.

✪ Special Operations Parachute Rigger Job Duty Task Analysis Board (JDTA)

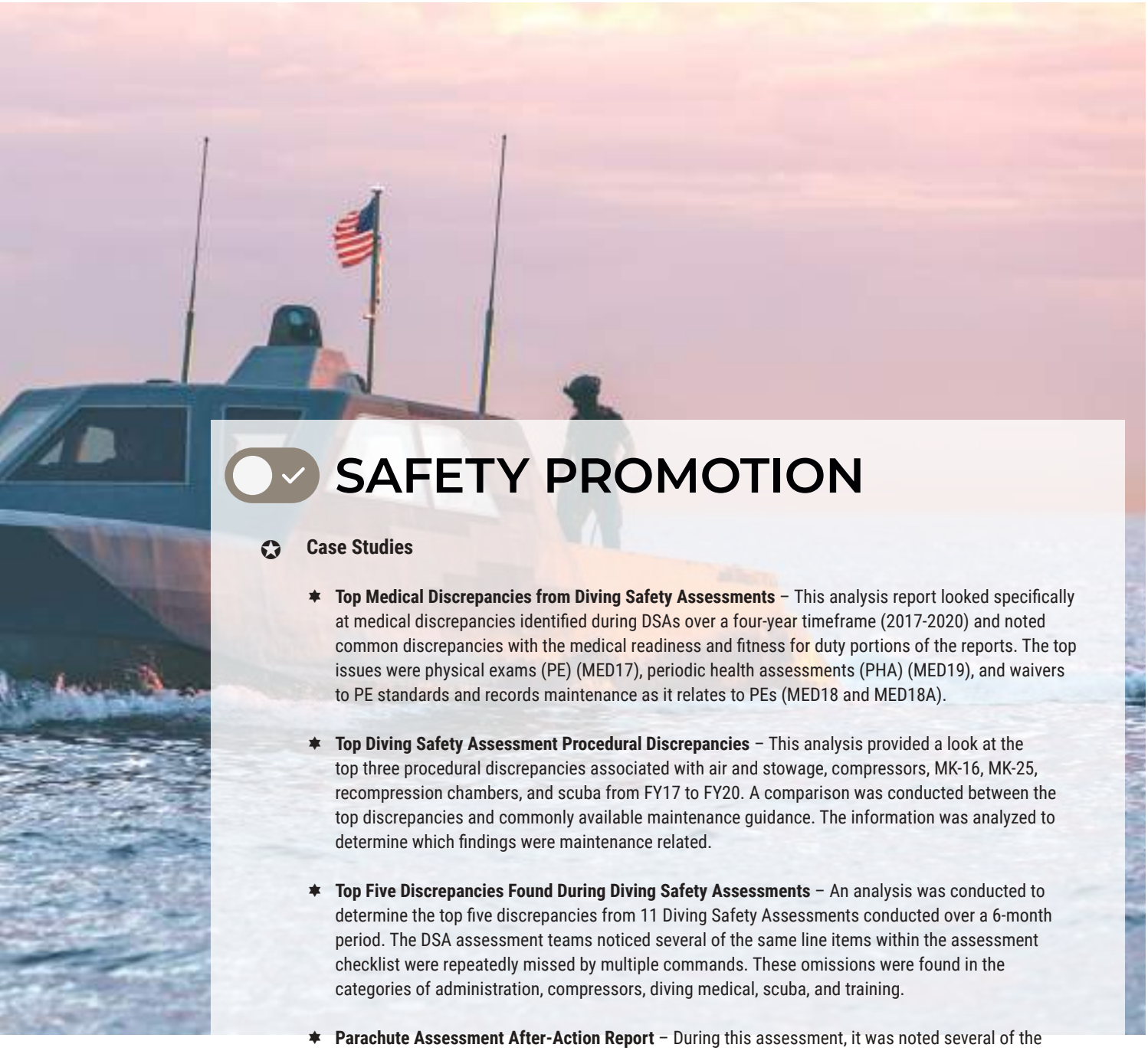
Advisory member on the Aircrew Survival Equipmentman Navy Enlisted Classification (NEC 773A) Special Operations Parachute Rigger (SOPR) Job Duty Task Analysis JDTA board. The formation of the JDTA was a result of a SOPR Safety of Life Letter dated April 23, 2018, and it will assess and advance training that is needed due to the current lack of training for senior-level SOPRs (NEC 773A) when returning to the expeditionary community from an operational fleet tour.

✪ Safety Assurance Letters

While conducting DSAs, Code 42 assessors were positioned to recognize patterns of safety concerns which otherwise might go unnoticed. The assessors identified two situations in 2021 which resulted in Safety Assurance Letters being signed by Commander, NAVSAFECEN, and delivered to the applicable technical authorities.

- Throughout several command assessments, Code 42 assessors recognized a pattern of confusion and neglect associated with Pressure Testing Chambers (PTC) located throughout the fleet. Upon further review, assessors discovered the Technical Drawings, Manufacturers Technical Manual and Maintenance requirements provided by Naval Sea Systems Command's (NAVSEA) website did not possess the necessary guidance and maintenance specifications for the proper care of PTCs around the globe.

- With the second Safety Assurance Letter, Code 42 assessors noticed issues pertaining to scuba cylinder high pressure rupture discs. The identification and installation of improper rupture discs was identified during multiple DSAs. Upon further in-depth investigation it was discovered that the approved technical documentation and procedures actually created the condition for this to occur. The written procedures did not consider alternate equipment configurations, which presented unsafe conditions. These configurations were discovered throughout the fleet.



SAFETY PROMOTION

Case Studies

- **Top Medical Discrepancies from Diving Safety Assessments** – This analysis report looked specifically at medical discrepancies identified during DSAs over a four-year timeframe (2017-2020) and noted common discrepancies with the medical readiness and fitness for duty portions of the reports. The top issues were physical exams (PE) (MED17), periodic health assessments (PHA) (MED19), and waivers to PE standards and records maintenance as it relates to PEs (MED18 and MED18A).

- **Top Diving Safety Assessment Procedural Discrepancies** – This analysis provided a look at the top three procedural discrepancies associated with air and stowage, compressors, MK-16, MK-25, recompression chambers, and scuba from FY17 to FY20. A comparison was conducted between the top discrepancies and commonly available maintenance guidance. The information was analyzed to determine which findings were maintenance related.

- **Top Five Discrepancies Found During Diving Safety Assessments** – An analysis was conducted to determine the top five discrepancies from 11 Diving Safety Assessments conducted over a 6-month period. The DSA assessment teams noticed several of the same line items within the assessment checklist were repeatedly missed by multiple commands. These omissions were found in the categories of administration, compressors, diving medical, scuba, and training.

- **Parachute Assessment After-Action Report** – During this assessment, it was noted several of the same issues identified years earlier with the SOPR Safety of Life Letter still remained without mitigation. The SOPR Letter was generated to raise awareness of the rotation in and out of the expeditionary community and lack of training for senior-level SOPRs (NEC 773A).

- **Man-Overboard Analysis Report** – Man-overboard mishaps and incidents have decreased over the past 16 years aboard warships and expeditionary small-craft vessels across the naval enterprise. Mishaps ranging from minor slips and falls at various severity levels to fatalities have generally decreased when compared two different eight-year date ranges (August 2004 – December 2012 and January 2013 – May 2021). The research's purpose was to use comparative analysis data to identify and assess if risk mitigation factors are adequately observed, according to CNO guidance regarding personnel safety across the fleet.

- **Tactical Vehicle RFI and Analysis for NECC** – The NECC safety submitted a request for information and analysis from the NAVSAFECEN to clarify recommendations of a Safety Investigation Board (SIB) convened for a fatal mishap that occurred in March 2021.

SAFETY PROMOTION, Cont.

Safety Newsletters

- **Drop Zone Newsletter** – The parachute safety analysts generated and released to the parachute community two Drop Zone newsletters highlighting trends, statistics, malfunctions, and issues associated with DOD airborne operations. The newsletters shared ideas and mitigation strategies to address relevant issues.

- **Diving Safety Lines Newsletter** – The diving analysts generated and provided to the dive community one Diving Safety Lines newsletter that captured relevant and timely information related to diving operations, management, and safety.

Magazine Articles

- **MK 20 Underwater Breathing Apparatus Mission Maintenance** – This article discussed what mission maintenance consists of, where to locate mission maintenance and recommendations on how to document the completion of mission maintenance correctly.

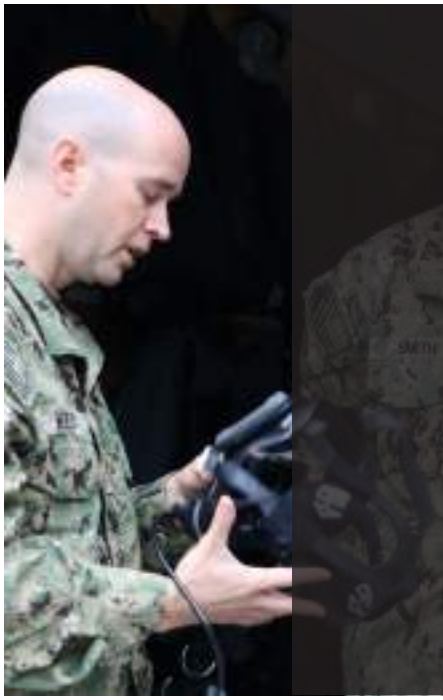
- **The Subject Matter Expert and the Deliberate Risk Assessment** – One of the primary shortfalls in effective RM is a properly completed Deliberate Risk Assessment (DRA) for the command's mission or task conducted. The failure of an effective DRA has direct impact on commands' efficiency, the wasting of resources and cost increases.

- **Initial versus Residual Risk Assessment Code for High-Risk Training Events** – The NAVSAFECEN identified several misunderstandings within the fleet regarding the OPNAVINST 1500.75,D High-Risk Training (HRT) Instruction, during assurance and assessment visits. One of the most contested requirements is that HRT is based on the initial Risk Assessment Code (RAC) and not the residual RAC. This has always been a sticking point with many commands but a complete and thorough understanding of the risk management process will alleviate this confusion.

- **Safe Planning and Execution of Over the Road Line Haul Operations** – Over the road line haul operations (non-combat convoys) conducted by the Navy are inherently dangerous and require a combination of operator skill and experience to be conducted safely. Not understanding safe following distances and proper spacing between vehicles is a common hazard associated with these operations. The purpose of this article was to raise awareness of these issues and propose options for remediation.

- **Acute Mountain Sickness** – This article discussed the three types of altitude sickness (Acute Mountain Sickness, High Altitude Pulmonary Edema, and High Altitude Cerebral Edema) and symptoms associated with them by telling a personal story.

- **Frostbite** – This article discussed frostbite, what leads to it and the signs and symptoms to watch out for. It also discussed appropriate treatment and mistakes people make when trying to rewarm their frostbitten areas on their own.



Lessons Learned (LL) and Sanitized Safety Investigation Reports (SSIR)

The expeditionary warfare team developed and drafted one LL and 10 SSIRs on the following topics in 2021:

- LL – Lessons learned from the loss of a SEABOTIX LBV- 300 Remotely Operated Vehicle (ROV)
- SSIR - Night military free-fall parachute training mishap resulting in injuries to two parachutists
- SSIR - Service member was injured during helicopter rope suspension techniques (HRST) tower training
- SSIR - Negligent discharge - Self-inflicted gunshot wound
- SSIR - LCAC was in the process of backing out of space when it hit protective pillars
- SSIR - Mishap Victim (MV) fell overboard and was not found
- SSIR - During a routine shooting evolution, a service member was accidentally shot while attempting to re-holster weapon
- SSIR - MV was injured during HRST training
- SSIR - Two service members succumb to shallow water blackout while spearfishing off-duty
- SSIR - MVs injured while cutting and disposing of old mooring piles
- SSIR - MV injured when handhold was lost during small boat surf passage operations

FY21 Expeditionary Warfare Mishap Trend Summaries

The Expeditionary Warfare Communities showed positive trends with reductions in reported mishaps for the last five fiscal years.

✪ Navy and Marine Corps Dive Operation Mishaps FY17-21

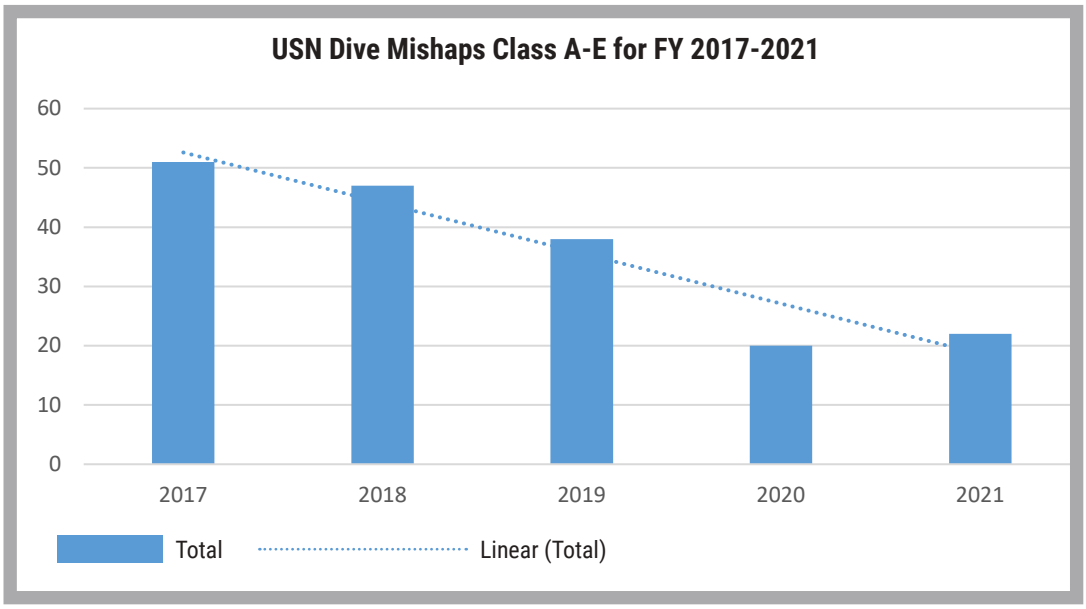


Figure 1. USN Class A – E Diving Operation Mishaps FY17-21

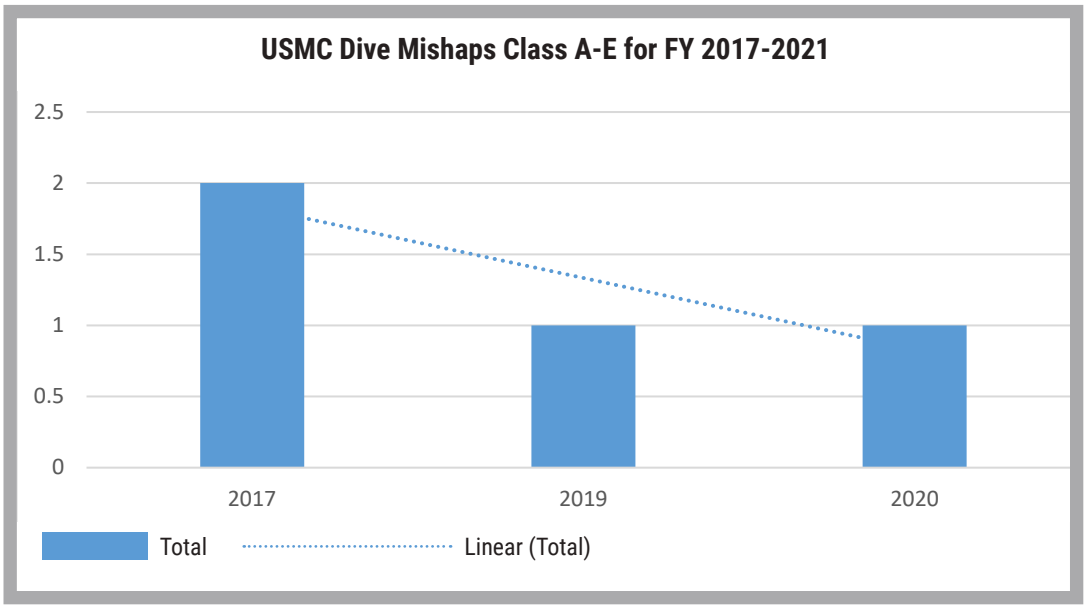


Figure 2. USMC Class A – E Diving Operation Mishaps FY17-21

USN and USMC dive operations continued the positive trend for Class A-E mishaps.

✪ USN/USMC Class A-E Parachute Operation Mishaps FY17-21

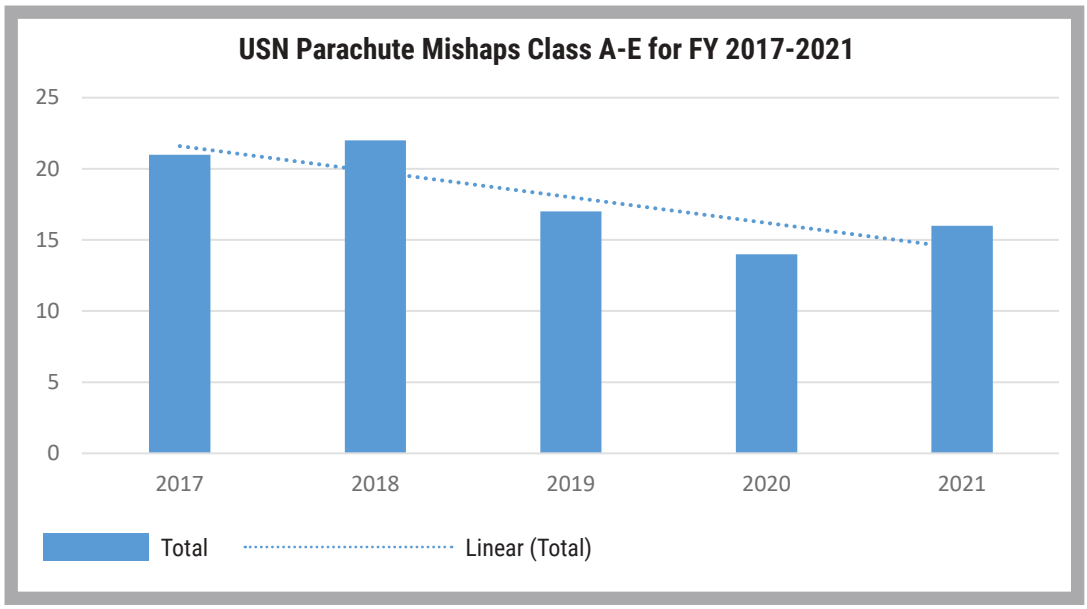


Figure 3. USN Parachute Mishaps Class A-E FY17-21

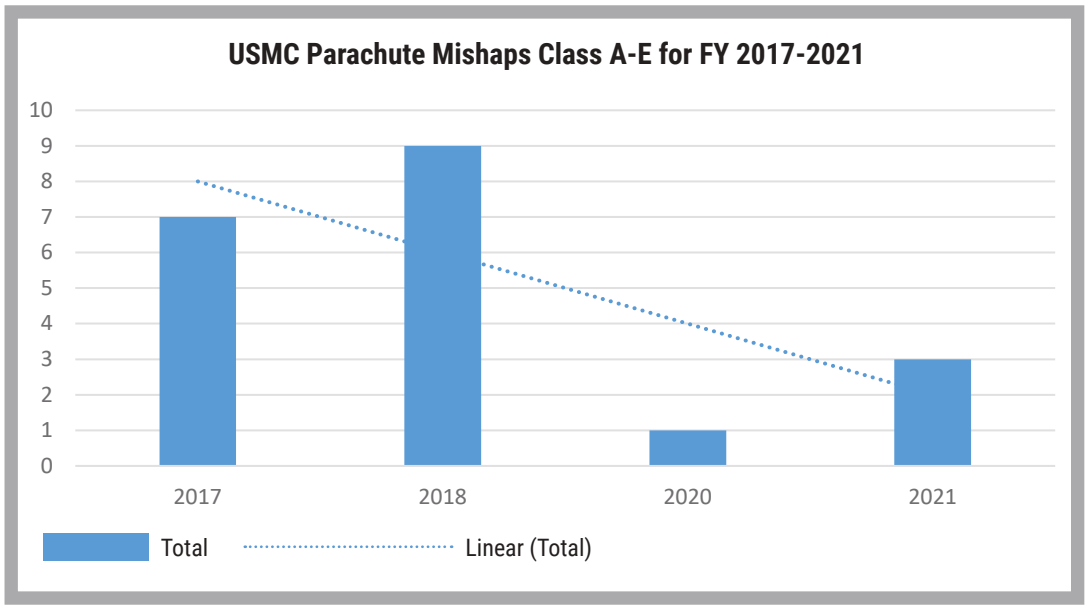


Figure 4. USMC Parachute Mishaps Class A-E FY17-21

USN and USMC Parachute operations continued the positive trend for Class A-E mishaps.

✪ Naval Beach Groups Class A-E Mishaps FY 2017-2021

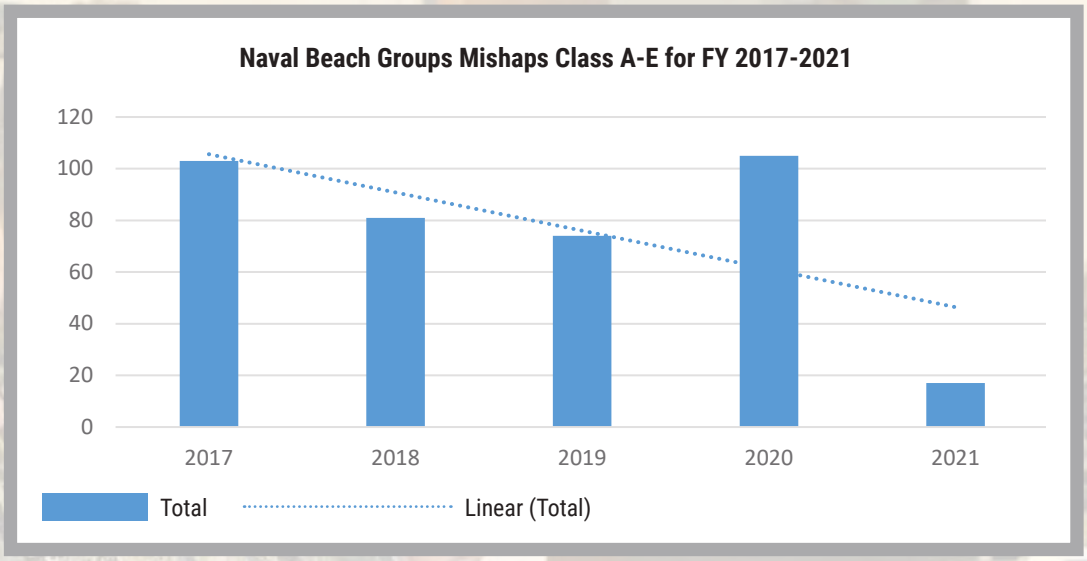


Figure 5. Naval Beach Group indicated a positive trend for Class A-E mishaps in FY21.

✪ Naval Special Warfare Class A-E Mishaps FY 2017-2021

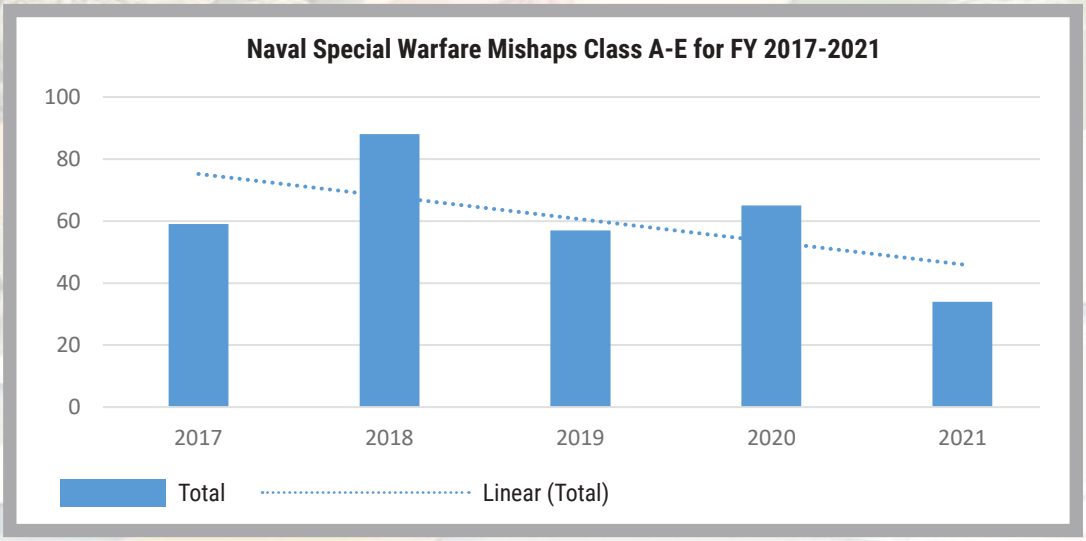


Figure 6. Naval Special Warfare Class A-E Mishaps FY 2017-2021

Naval Special Warfare continued the positive trend for Class A-E mishaps.

✪ Naval Expeditionary Combat Command Class A-E Mishaps FY 2017-2021

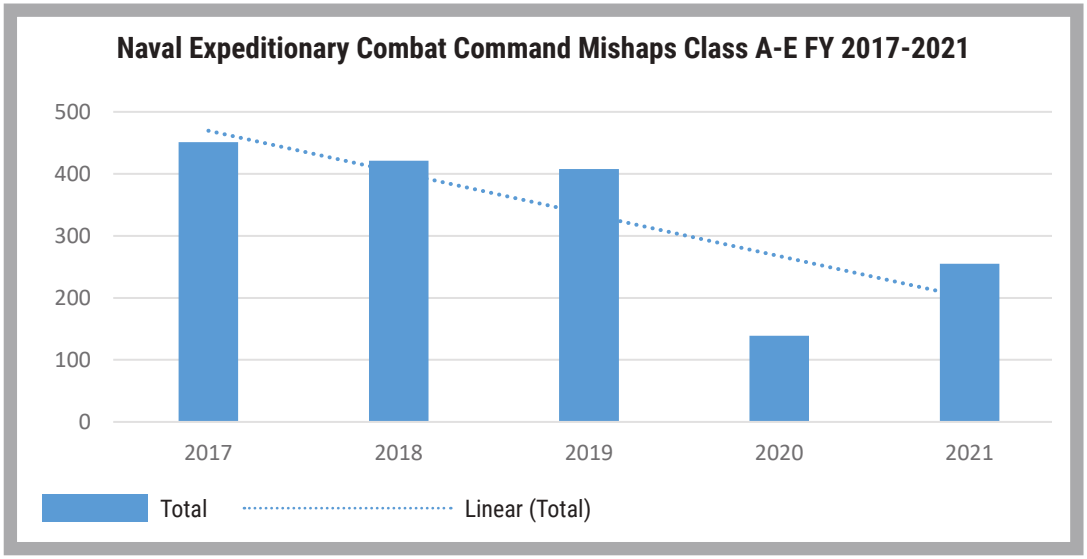


Figure 7. Naval Expeditionary Combat Command Class A-E Mishaps FY 2017-2021

Naval Expeditionary Combat Command continued the positive trend for Class A-E mishaps.

✪ 2021 Opened and Closed Class A Mishaps

Class A Reports Opened in 2021		
Mishap Command	**Date of Mishap**	**Community**
NMCB-5	2 March 2021	NECC
ST-8	4 Dec 2021	NSW
Class A Reports Closed in 2021		
Mishap Command	**Date of Mishap**	**Community**
NMCB-5	2 March 2021	NECC

2021 Outstanding Mishap Recommendations

Outstanding MISRECs - Expeditionary									
Consolidated TYCOM	**Currently Due**	**Number of Years Old**							
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**
NECC	5	1	0	0	4	0	0	0	0
NSW	5	0	1	0	3	0	1	0	0
NBG	0	0	0	0	0	0	0	0	0
	10	1	1	0	7	0	1	0	0

APPENDIX E: CODE 50

KNOWLEDGE MANAGEMENT AND SAFETY PROMOTIONS (KMSP) DIRECTORATE

SAFETY POLICY, RISK MANAGEMENT, ASSURANCE, AND SAFETY PROMOTION

About Us

The Knowledge Management and Safety Promotions (KMSP) Directorate (Code 50) reaches across all warfare communities and areas of expertise of the Naval Safety Center (NAVSAFECEN) and is a key driver in NAVSAFECEN's transformation into a forward-looking organization that provides advanced analytics and sophisticated modeling data that can be used to prevent and mitigate mishaps. KMSP is responsible for database management, data modeling and analytics, developing and tracking leading indicators for safety, and promulgating safety and risk management information to fleet stakeholders.

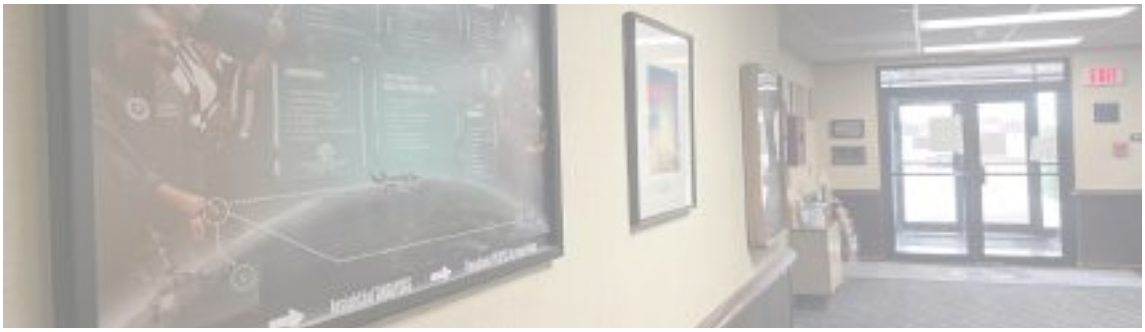
The KMSP Directorate is comprised of two functions: The Data Management and Data Services Division, and the Safety Promotions Division comprised of Public Affairs, executed by the Media and Communications Division and Lessons Learned Division.

2021 Overview

The KMSP Directorate spent CY21 promoting a culture of excellence across the Department of the Navy (DON) by providing advanced data analytics, in-depth studies, trends, data visualization, and development and distribution of targeted communication products to our Sailors, Marines and civilians.

- The Data Management and Data Services Division focused on two significant lines of effort for 2021 - Data Visualization and Quality Control, which are directed toward improving tools and processes respectively. The Data Management Division initiated a comprehensive data visualization effort to provide stakeholders with the necessary tools to enable them to track and explore safety issues occurring in operational forces. The first dashboard provided data on Carrier Strike Groups. The division also began developing Quality Control management metrics targeting data inputs. Both efforts are exploratory and ongoing.

- The Safety Promotions team provided communications support for every directorate within the NAVSAFECEN organization, and expanded its reach to the naval enterprise through diverse product development, improvement in social media execution, and promulgation of targeted communication plans to support the NAVSAFECEN mission.



The KMSP is the steward of safety risk management for NAVSAFECEN's Safety Management System (SMS).

✸ Data Services Division

- ✪ The Data Services Division provided immediate support for several high-visibility mishaps and congressional data calls. Since the transition from WESS and the WESS Aviation Mishap and Hazard Reporting System to RMI, the division has focused on reconciling data.

- ✪ The division also added three employees to meet its increased emphasis on quality control as it relates to data integrity and data mining. Notably, the team created recurring reports for customers to access at their discretion.

- ✪ The division provided group and individual training on using the Risk Management Information Streamlined Incident Reporting (RMI SIR) Data Extraction Tool and Advanced Query Tools, enabling staff and external customers to create and modify their individual queries.

✸ Operations Research Division

- ✪ The Operations Research Division conducts studies using advanced and predictive data analysis and shares its finding DON-wide through studies and analysis. The Safety Promotions Division further shares these findings via magazines, newsletters, Lessons Learned and Sanitized Safety Investigation Reports. The Operations Research Division researched and published four studies in 2021.

- ✪ The division continued to collaborate and support several studies related to safety and performance with Naval Air Systems Command's (NAVAIR) High-Performance Division and Commander, Naval Air Forces' (CNAF) Data Analysis Division.

    - ➲ Carrier Strike Group (CSG) Dashboard for Afloat Safety: Continued to further develop and fine-tune the dashboard display of CSG safety mishap statistics for use by type commanders and CSG staffs;

    - ➲ Expeditionary Strike Group (ESG) Dashboard for Afloat Safety: Continued to further develop and fine-tune the dashboard display of ESG safety mishap statistics for use by type commanders and ESG staffs. This dashboard is on pause while decision-makers decide ESG composition.

✸ Data Management Division

- ✪ The Data Management Division spent considerable time supporting RMI data requests and facilitating the command's ability to maintain back-end access to naval mishap data. At the beginning of the year, the division focused on helping the RMI data migration validation efforts, which concluded in February. In March, the division began moving into the Jupiter dashboard environment to explore its features and capabilities, including Robotic Process Automation (RPA), Data Loading / Prepping, Machine Learning capabilities, and Data Visualization.

- ✪ In the following months, the division made considerable progress in learning to use RPA with UiPath (Automation), Trifacta (Data prep), Databricks (R & Python scripting environment), and Qlik (Dashboarding app). The command currently has access to 10 databases on Jupiter via Databricks, with more coming, including the Defense Manpower Data Center (DMDC) and the Medical Readiness Reporting System (MRRS) databases.

Data Analytics Division

- In CY21, the Data Analytics Division continued building, documenting, and operationalizing models.
- The team instituted an industry-standard version control GitLab process allowing additional members to contribute to the project quickly.
- The team built models for predicting the risk of Class A and B flight mishaps, Class C AGMs, and using shipboard maintenance history to predict mishaps.
- The team used these new models and the existing Class A and B afloat mishaps prediction models to provide risk assessments for four carrier strike groups with their assigned carrier air wings at CNAF's request, and for five individual ships of interest to Commander, Naval Surface Forces.
- In addition to the documentation of the models themselves, the team researched and drafted studies on the use of Battle 'E' award winners in the model construction process and the seasonality of operations that need to be accounted for when training models.
- The team refined feature generation and model building scripts and established high-performance computing processes to reduce the time required to train new models. This project is being used to test cloud data and computing capabilities in the DON's Jupiter/ADVANA environment and the Army Analytics Group's Cloud-based Person-Event Data Environment.
- The division continued to share this work with the larger naval enterprise via presentations to the Naval Applications of Machine Learning Symposium, the Navy Data Community of Practice and Excellence Data Science & Analytics Workshop, and the Force Readiness Analytics Group's Aviation Ground Mishap Performance to Plan cohort.

Aviation Knowledge Management Branch

- During this past year, the team completed 12 analytical studies on aviation-related safety and risk management topics in flight and maintenance. In addition to this research, they conducted several ad-hoc projects such as risk mitigation following the inception of the APG-79 radar, wearable health monitoring systems, and re-categorization of mishap causal factors.
- The branch also provided quantitative analysis to the Aviation Safety Directorate, supporting a CNAF-directed comprehensive safety and risk management review of the Chief of Naval Air Training (CNATRA). The project spanned a 10-year timeframe and examined practices, programs, and safety culture.
- Lastly, the team began an in-depth analysis of naval airfield safety, identifying and examining risk gaps while linking various parties such as CNAF and NAVAIR to aid in risk mitigation and hazard elimination.

Shore Knowledge Management

- Shore QC is the backbone of all quality injury data for shore analysis. Shore QC sees greater than 47% of all injures submitted into RMI.
- The NAVSAFECEN closed 7,100 reports in CY21, of which 2,901 reports were ground and over 600 fell in the motor vehicle category.
- Shore QC developed the standardized QC guide for all QC personnel and created six RMI selection guides for the fleet to assist in standardizing RMI data input in areas of COVID-19, hearing loss, shipyard ground fire selection, requesting report extensions; and performing essential RMI account updates and where to find information in RMI.

- The branch delivered motor vehicle information for the CNO Briefs, SECNAV 2021 request, TYCOM Safety Summit brief, the ASC and CSG presentations, as well as monthly Safety Quality Council (SQC) briefs.

- The team provided input for the Navy's All Hands Magazine and National Safety Council articles and Safety Promotions' presentation for Fall and Winter Safety.

- Internally, the team provided ideas and information to the Lessons Learned Division in areas of private motor vehicles, and motorcycle driver safety, pedestrian mishaps, animal attacks, data extraction, off-duty firearms accidental discharge, seasonal sports, actions leading to off-duty injuries including swimming and fireworks, incorrect tools for the task, falls and falling objects including slips, trips, and dental work.

- The Rider Down monthly reports for motorcycle mishaps continued to be one of the most reviewed products available on the NAVSAFECEN website.

Afloat Knowledge Management Division

- The Afloat Division, Code 518, performed master's-level research and analysis of 1,910 afloat mishap reports and seven shipboard risk assessments/inspections with a focus on: Preventative Maintenance, AFFF, Spillage, Class C Fires, Shipboard Discharges, Galley Injuries, Inadvertent Firearm Discharges, SUBFOR Mishaps, and Electrical Discharges.

- The team also processed two requests for information from higher headquarters and discovered a risk control design omission by Naval Sea Systems Command (NAVSEA) that continued faulty procedural language in NSTM Chapter 300; the team inserted corrective language and institutionalized future NAVSAFECEN participation in NAVSEA risk design reviews.

Expeditionary Knowledge Management Branch

- The branch completed a risk mitigation study of convoy operations to support Naval Expeditionary Combat Command in answering a safety incident report (SIR) recommendation to incorporate electronic driver aids on over-the-road vehicles.

- The team also supported data visualization for the CNATRA review of the VT/HT community to identify emerging mishap trends. As part of the data visualization team, the branch completed Tableau testing on the RMI server for data visualization, and continued exploring BI tools for the NAVSAFECEN to provide dashboards for the naval enterprise.

- The staff completed a three-year study with CNAF and CNA focusing on primary causal factors and mitigations using the P2P process for Aviation Class C AGMs.

- The branch also provided in-house training for SMEs and warfare directorates on the analytical study process and conducted executive leadership training for division heads in the KM directorate.

- **Unit Pulse Scans**. The Expeditionary Knowledge Management Branch completed two Pulse Scans in conjunction with culture workshops to provide actionable insights into unit behaviors for command-level risk mitigations.

    - The Unit Pulse Scan is an innovative, narrative-based research tool that gives unbiased feedback of happenings at a command. The narrative is depicted as a free-thought written story, and from that, the analysis conducted by NAVSAFECEN personnel generates actionable insights and guides command interventions. The method provides an approach to capture, analyze, and identify command behaviors and leading indicators that are not identified through traditional measures, such as safety reports or assurance visits. This method, conducted at the command's request, enhances leadership's ability in identifying risk factors, promotes awareness, and enables targeted risk mitigations along with corrective actions.

SAFETY PROMOTION

The Safety Promotions' Media and Communications Division, and Lessons Learned Division developed and distributed a wide array of communication products to support the needs of specific naval enterprise communities as well as a broad range of informational and strategic communication products tailored to the needs of NAVSAFECEN's internal and external audiences.

Media and Communication Division

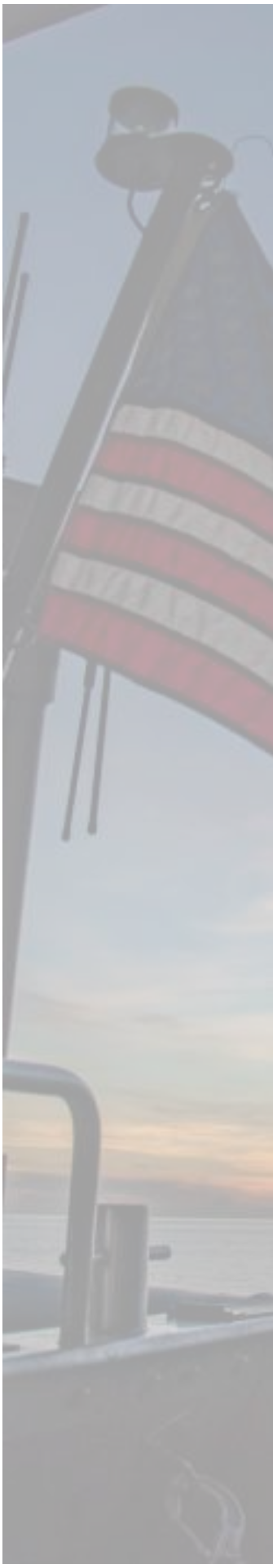
In CY21, the Media and Communication Division continued supporting internal staff and its external customers and stakeholders through various media and public affairs initiatives.

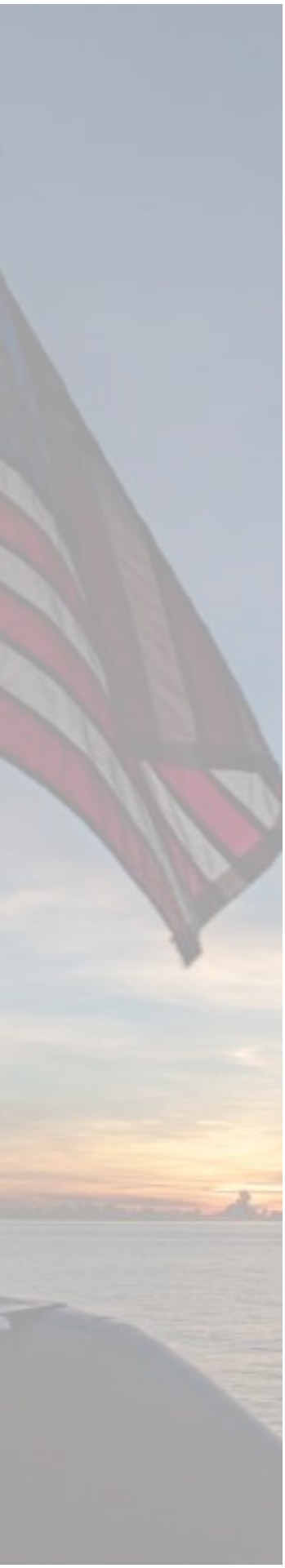
- The division developed strategic messaging supporting major initiatives, including the Major Fires Review and Naval Safety Command establishment.
- The Media and Communication Division also provided full-fledged support to NAVSAFECEN's lines of effort through close collaboration with all warfighting directorates.
- Published three *Approach* magazines, two editions of MECH magazine, and one issue of the nascent Ground Warrior magazine supporting Marines Corps and naval expeditionary forces.
- The division reviewed and edited 41 case studies.
- Provided copy editing, layout and design, and editorial expertise for four PEAT Newsletters, four editions of the Ship's Safety Bulletin (SSB), four Factual Lines About Submarine Hazards (FLASH) newsletter, 39 aviation safety grams, two expeditionary safety grams, one DATALINE newsletter, and 12 Rider Down Monthly reports.
- The team also produced three articles and graphics for the National Safety Council's Family Health and Safety Magazine.
- To highlight the NAVSAFECEN mission, the team produced three safety presentations, 24 videos highlighting the "101 Days of Summer," Fall and Winter Safety, distracted walking and driving, lessons learned, and mishaps to internal and external audiences.

Safety Campaigns

The Safety Promotions team launched three major safety campaigns in CY21. Campaign products included messaging, training presentations, press releases, ALSAFEs, and multimedia products that were distributed via email, for download on the command website or via social media platforms to ensure maximum reach to the naval enterprise. The Media and Communication and Lessons Learned divisions developed more than 100 unique products for these campaigns.

- **"You're the Key to Motor Vehicle Safety" April 26 – Sept. 15, 2021**. The campaign aimed to increase awareness on the top contributing factors to motor vehicle accidents, and inform Sailors and Marines on ways they can reduce the likelihood and severity of motor vehicle mishaps through appropriate risk management strategies and best practices. Campaign topics emphasized the importance of preparedness, use of protective equipment and the dangers of distracted driving during use of private motor vehicles as well as recreational motor vehicles to include off-road and all-terrain vehicles, motorized electric scooters and boats. The Safety Promotions team developed roughly 50 unique communication products for the campaign.
- **"101 Critical Days of Summer" May 28 – Sept. 6**. The "101 Critical Days of Summer" is an annual Navy and Marine Corps safety campaign intended to increase awareness of potential risks related to off-duty recreational activities, as well as other summer endeavors. The campaign launches at the start of Memorial Day weekend and runs through the end of Labor Day weekend. Mishaps, as well as associated deaths, have historically spiked during this time of year.





- **"Fall and Winter Safety" Oct. 15, 2021 – March 1, 2022**. Fall and Winter Safety is an annual Navy and Marine Corps safety awareness campaign intended to increase awareness of potential risks related to off-duty recreational activities, as well as other fall and winter endeavors. The campaign launches at the beginning of October and runs through the middle of March. Private motor vehicle injuries and fatalities as well as mishaps from weather and seasonal-related activities typically spike during the fall and winter months and it is imperative to remain resilient and mitigate risks.

Digital Platforms

The Safety Promotions Division uses the following online communication channels to promote NAVSAFECEN messaging: the organization's public-facing website; Facebook, Instagram, Twitter and LinkedIn social media platforms; Defense Visual Information Distribution Service (DVIDS), and Department of Defense (DoD) Live, and ISSUU digital publishing platforms for NAVSAFECEN magazines.

- **NAVSAFECEN experienced growth across all social media platforms in 2021**
  - In 2021, compared to 2020, AFPIMS reports the command's website had 440,677 visitors, up 193.46%.
  - In 2021, compared to 2020, Facebook reach increased 2.1% to 158,196.
  - Throughout 2021, Instagram reach increased by 489.5% to 2,641.
  - Twitter impressions improved when we consistently posted on a daily basis beginning in July.
  - YouTube currently has 1,020 subscribers after creation of a new channel went up in August 2021.

- **2021 marked the second year of use for Google Analytics**
  - We remain slightly above our rate of returning visitors compared to our first use of Google Analytics last year.
  - Website bounce rate ~25% in 2021, which outperformed industry website standards of 40-50%. Users visited and engaged with the website rather than leaving, such as clicking links.
  - Metrics collected in 2021 and going forward will continue to inform our digital plans for developing and sharing safety-oriented material with the fleet to reinforce the primary theme of preventing on- and off-duty mishaps to preserve mission readiness and keep our Sailors, Marines, and civilians safe.

Published Studies

- **Operations Research**
  - Motorcycle mishap analysis: This effort examined whether PMV-2 fatalities were more prevalent across the naval enterprise than in the general U.S. population. Our NAVSAFECEN analysts compared Navy and Marine Corps fatality rates with U.S. fatality rates, categorized by service, age group, and gender, over the 2010-2019 timeframe. Fatality counts from the WESS, U.S. Census, and National Transportation Safety Highway Board (NTSHB) data were used.
  - Quality control metrics for incoming data: This analysis identified and recommended quality control processes and metrics for use on RMI SIR data. The intent was to provide senior management with visibility on the data's quality and the quality of NAVSAFECEN quality assurance processes and personnel.
  - Pedestrian mishaps for Shore Knowledge Management: This analysis was descriptive in nature, identifying causes of pedestrian mishaps for Navy personnel.

- Class C AGM modeling: This ongoing effort is modeling Class C Aviation Ground Mishaps to explain why there is a recent upward trend in this mishap category, and whether personnel turnover or experience are explanatory variables.

✪ KM Aviation Branch

- The Breaking Down of Technical Directive Screenings
- A-799 Correlation to Mishaps
- Sea versus Shore Crunch Mishaps
- PMV-2 Aviation Study
- Decline in Flight Hours
- Mishap Frequency using Exponential Distribution
- Maintainer Falls from Aircraft
- Near and Mid-Air Collisions
- Manning Levels Contributing to AGMs in the MH-60S Community
- Differences in Types of AGM Occurrences During Day-Shift Hours
- Changes in AGMS between P-3 and P-8
- Air Capable Ships Aviation Mishaps

✸ Lessons Learned Division

The Lessons Learned Division collects, analyzes, publishes, and archives safety lessons learned information to include trends, analysis, and best practices. These products are disseminated via email and are available on the NAVSAFECEN website.

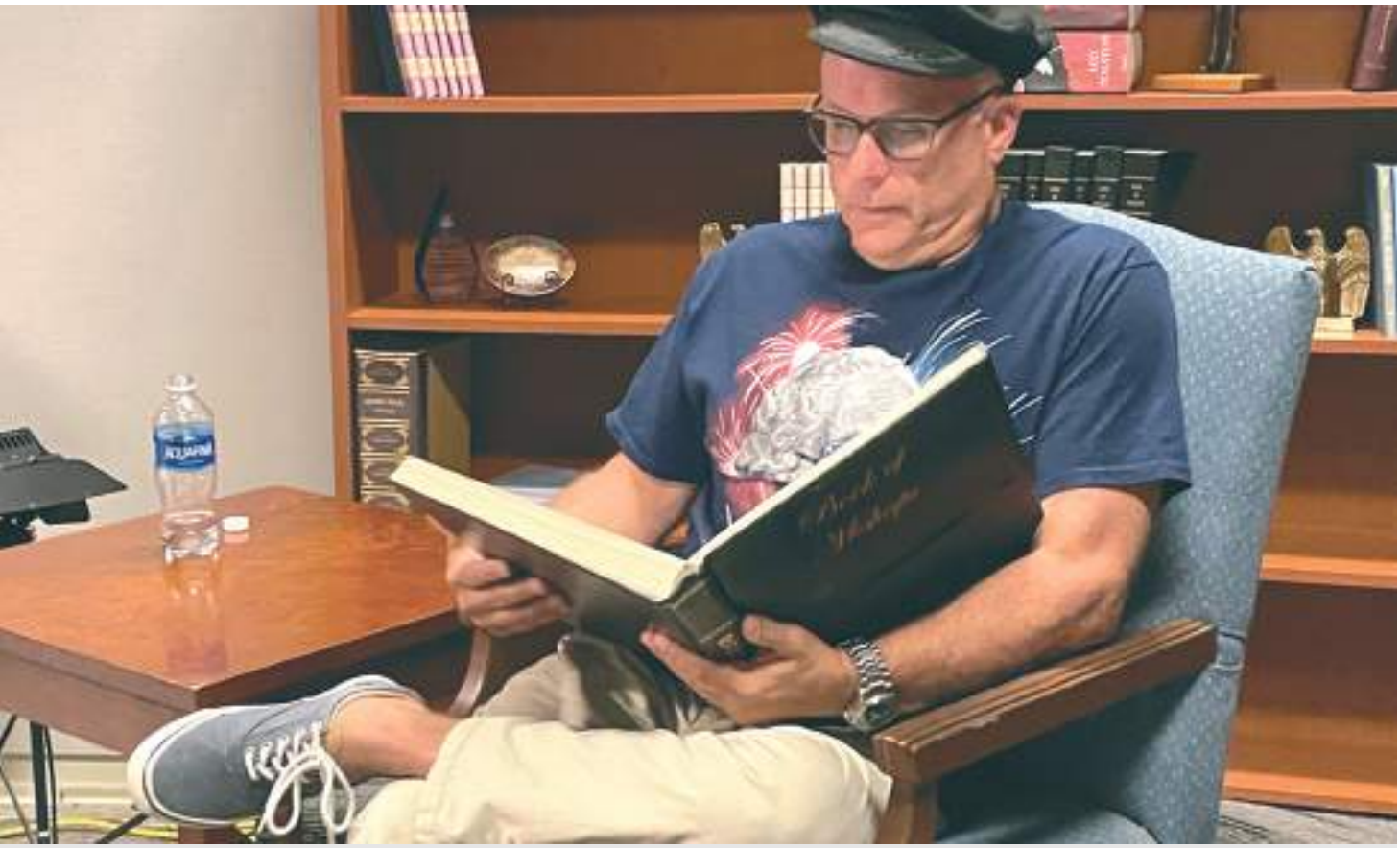
✪ Lessons Learned (LL): A safety LL is an article intended to convey a message of how to prevent a future mishap. The content and style of LLs will vary, and LLs may be based upon a single mishap or hazard, a series of incidents, a general mishap category, or an identified best practice. The titles are numbered by calendar year.

✪ Sanitized Safety Investigation Reports (SSIR): A SSIR is a redacted safety investigation report which has been sanitized of safety-privileged information and condensed into a concise, readable format which conveys a clear message to Navy and Marine operators of what happened, why it happened, and how to avoid repeating the mishap. The narrative, causal factors, and recommendations are simplified versions of what was determined by the original investigators and endorsers. The titles are numbered by calendar year.

In CY 21, the Lessons Learned Division developed and disseminated the following 49 Lessons Learned and Sanitized Safety Investigation Reports for the fleet and Marine Corps. Copies are archived on the Lessons Learned page of the NAVSAFECEN's CAC-enabled website at https://intelshare.intelink.gov/sites/nsc/.

✸ Lessons Learned

LL 21-01 Winter Sports Mishaps (II)
LL 21-02 Parachute Jump Exits
LL 21-03 Lithium Battery Fires
LL 21-04 Aircraft Towing Mishaps



LL 21-05 Formality and Communication Breakdown
LL 21-06 Aviation Cargo Loading Hazards
LL 21-07 Electrical Mishaps
LL 21-08 Shipboard Forklift Mishaps
LL 21-09 Random Acts of Senselessness
LL 21-10 Off-Duty Firearms Mishaps
LL 21-11 Naval Safety Center's Summer Vacation
LL 21-12 Animal Mishaps
LL 21-13 Afloat "Big Gun" Negligent Discharges
LL 21-14 E-Scooters (Episode III)
LL 21-15 Motorcycle Mishaps
LL 21-16 Fireworks (Episode II)
LL 21-17 Shipboard Steering Casualties
LL 21-18 Heat-Related Mishaps
LL 21-19 Aircraft Cable-Car Wire Strike
LL 21-20 Helicopter Midair Collision
LL 21-21 "Cutting Corners"
LL 21-22 Afloat Tug Related Mishaps
LL 21-23 PT Related Injuries
LL 21-24 On-Duty Firearm Negligent Discharges
LL 21-25 Concussions
LL 21-26 AAV Sinking Mishaps
LL 21-27 Afloat Missile Firing Mishap
LL 21-28 The Slips and Trips of FALL
LL 21-29 Autumn Fires
LL 21-30 Off-Duty Firearms Mishaps (VI)
LL 21-31 Holiday Ladder Falls
LL 21-32 Driving Safety

✸ Sanitized Safety Investigation Reports (SSIR)

SSIR 21-01 Missile Dropped During Loading
SSIR 21-02 HESCO Barrier Mishap
SSIR 21-03 20mm Guns Damaged by Wrong Ammo
SSIR21-04 Aircraft Primary Servos Damaged During Maintenance
SSIR 21-05 OBOGS Incident (HAZREP)
SSIR 21-06 Aircraft Nose Gear Retracted On Deck
SSIR 21-07 Mountain Road Rollover
SSIR 21-08 Helicopter Taxiing Mishap
SSIR 21-09 Formation Flight Midair Collision
SSIR 21-10 Helo Rescue Swimmer Hoisting Mishap
SSIR 21-11 Helo Rocket Firing Mishap (CFIT)
SSIR 21-12 Shipboard Hot Work Fire
SSIR 21-13 Post-Flight Fall from Aircraft
SSIR 21-14 Aircraft Flown With Engine Damage
SSIR 21-15 Aircraft Hard Landing
SSIR 21-16 Aircraft Flown with Low Engine Oil
SSIR 21-17 Tree Felling Mishap


The Second and Most Important Mistake Was
Something We All Are Guilty of Sooner or Later:
COMPLACENCY
—Lt Dave New, GHSL-51

APPENDIX E: CODE 90

MISHAP INVESTIGATIONS DIRECTORATE

About Us

The Mishap Investigation Directorate (Code 90) provides onsite and distance investigative support for Navy and Marine Corps mishaps covered under OPNAV 3750.6 Naval Aviation Safety Management System series and OPNAV/MCO 5102.1 Navy and Marine Corps Mishap and Safety Investigation, Reporting, and Record Keeping Manual series instructions. Code 90 maintains an extensive contact network of engineering and subject matter experts (SME) who can provide technical expertise during investigations.

2021 Overview

From initial notification through salvage, investigation, and wreckage and evidence release, highly qualified and experienced Naval Safety Center (NAVSAFECEN) investigators guided organizations through the process.

Along with Code 90's high-operational tempo primarily supporting Class A investigations, its investigators were equally engaged in other opportunities and initiatives supporting the NAVSAFECEN mission. Our efforts in reducing mishaps to improve readiness included:

- Extending support for Class B and below mishaps
- Assisting in the development and dissemination of lessons learned and sanitized safety investigation reports for the afloat, ashore, aviation, and expeditionary communities
- Conducting high-risk training assessments
- Conducting Marine Corps ground studies
- Providing ground mishap investigations courses to increase aptitude for ground safety officers and ground safety managers
- Writing analytical papers

During calendar 2021, investigators supported 52 aviation mishap boards, safety investigation boards (SIBs), and explosive SIBs.

SAFETY POLICY

- Updated and republished OPNAV 3750 Flip Series Guide for aviation mishaps. This update was conducted in collaboration with the Aviation Safety Directorate (Code 10).

SAFETY RISK MANAGEMENT

- Instructed 16 Ground Mishap Investigation Courses.
- In mid-2021, Marine Corps commands requested additional hands-on training to aid in the transition from the Web-Enabled Safety System (WESS) to Risk Management Information Streamlined Incident Reporting (RMI SIR). Code 90 created an RMIenhanced training course to fulfill this need. This course walked senior investigating officers (SIOs) through the safety investigation report (SIREP) entry process, and explored and offered solutions to common entry mistakes.

The training course leveraged the RMI Simulator to enable SIOs to get hands-on experience and enabled them to enter accurate SIREPs. The course was geared toward civilian safety professionals who could train transient active-duty Marines as they came into their safety roles. Investigators taught eight classes in 2021.

SAFETY ASSURANCE

In 2021, Code 90 provided on-site investigative expertise for the USS Bonhomme Richard (LHD-6) fire; the Navy's most destructive vessel fire since the 2012 USS Miami (SSN-755) mishap. The staff prepared and released a Safety Assurance Letter to fleet commanders and commanders, Naval Sea Systems Command (NAVSEA) and Naval Installations Command (CNIC) regarding major shipboard fire trends.

In response to the NAVSAFECEN letter, the vice chief of naval operations (VCNO) tasked the fleets to work with NAVSEA, Naval Reactors (NR), CNIC and NAVSAFECEN to perform a deep dive on the historical record to understand and address systemic issues underlying the persistence of shipboard fire mishaps and recommend actions to establish the necessary culture and standards required to change Navy fire safety outcomes in an enduring way. This in turn led to a Major Fires Review (MFR) Board, which included Code 90 Afloat investigators.

Additionally, afloat investigators provided assistance to the VCNO's high-visibility tasker, the Navy Fire Culture Project, which evolved from the MFR board. This project involved coordinating and working internally with Codes 20, 30 and 50, and external commands (NAVSEA, and Commander, Fleet Forces Command) to focus on the cultural issues related to fires fleet-wide that occurred at sea, and in port during private and public availabilities.

As a result of the MFR, NAVSEA established the Industrial Fire Safety Assurance Group. Code 90 was asked to participate in this group and develop a "notification of fires process" for use in the shipyards.

Background Summary

On July 12, 2020, while in week 88 of a CNO-maintenance availability at Naval Base San Diego, California, a fire broke out aboard USS Bonhomme Richard (BHR) in the lower vehicle storage compartment. The fire burned for five days, spread to 11 of 14 decks, and reached temperatures exceeding 1,400 F. The fire resulted in more than $3 billion in damage and a subsequent decision to decommission what was one of the U.S. Navy's most combat-capable amphibious assault ships.

The NAVSAFECEN began a comprehensive historical review of major fires aboard U.S. Navy ships during the early stages of the BHR investigation. NAVSAFECEN identified multiple recurring trends in causal factors in 15 shipboard fire-related events over a 12-year period that culminated with the BHR fire. Based on this historical analysis, NAVSAFECEN concluded with the release of a Safety Assurance Letter to Fleet commanders, NAVSEA and CNIC.

Background Summary, Cont.

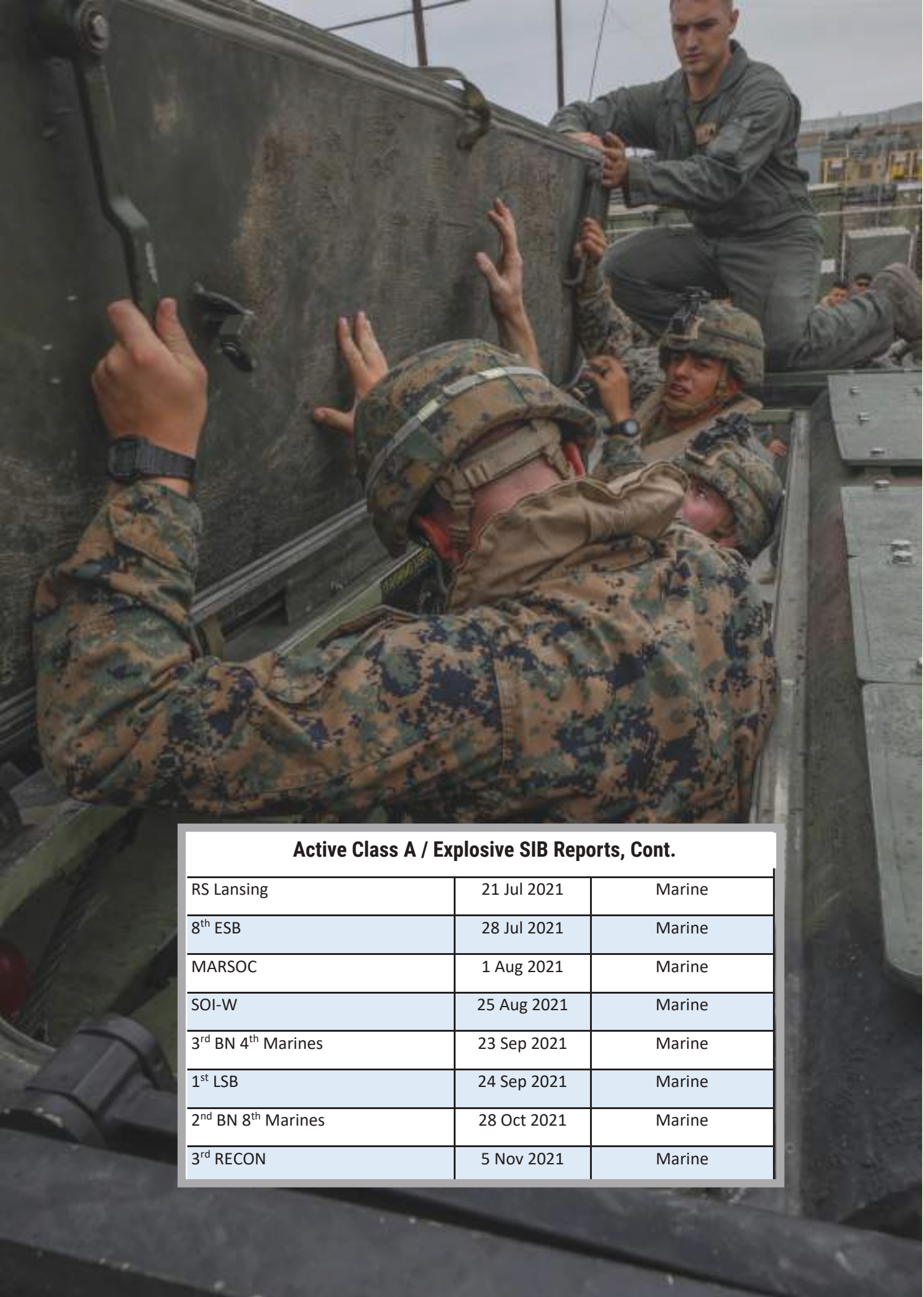
The review indicated there was non-compliance with policy. Thirteen of these fires occurred while ships were in port and the majority began outside of standard ship working hours. Post-review of these fire mishaps found that production, meeting timelines, and cost concerns were the primary focus of leadership down to the team level. Compliance was noted as a secondary focus. In a plurality of these mishaps, focus was consistently lost on basic risk mitigation strategies and controls, and the importance of required training, effective watch bills, appropriate daily meetings and communication, daily walk-throughs, and oversight assessments/inspections were not always primary safety considerations. Cumulative hazards were the result of a gradual, unrecognized accumulation of risk – despite the controls delineated in governing publications. Over time, normalization of deviance occurred.

Safety Investigation Boards (SIB)

- Code 90 investigators convened 52 Class A and Explosive SIBs in CY 2021: Afloat-5; Ashore-8; Aviation-25; and USMC-14.
- The team closed 50 SIBs: Afloat and Shore, 12; Aviation, 18; and Marine Corps Ground, 20.

SAFETY INVESTIGATIONS BOARDS		
Active Class A / Explosive SIB Reports		
Mishap Command	**Date of Mishap**	**Community**
Naval Air Warfare Center	04 Jan 2021	Afloat
USS MCFAUL	15 Mar 2021	Afloat
USS KEARSARGE	14 Apr 2021	Afloat
USS CONNECTICUT	02 Oct 2021	Afloat
USS MILIUS	09 Nov 2021	Afloat
VFA-106	22 Mar 2021	Aviation
HSC-12 Salvage (2020 mishap)	19 Mar 2021	Aviation
VFA-106	22 Mar 2021	Aviation
VT-22	24 Mar 2021	Aviation
YUP-19/MQ-4A	20 Apr 2021	Aviation
VFA-213	22 Apr 2021	Aviation
HSC-21/MQ-8B	26 Apr 2021	Aviation
VT-22	17 May 2021	Aviation
VFA-113	09 Jul 2021	Aviation
VFA-106	12 Jul 2021	Aviation
VMFA-121	13 Jul 2021	Aviation
NAS Fallon SAR	16 Jul 2021	Aviation

Active Class A / Explosive SIB Reports, Cont.		
VFA-146	26 Jul 2021	Aviation
VP-46	05 Aug 2021	Aviation
HT-18	19 Aug 2021	Aviation
VT-22	19 Aug 2021	Aviation
HSC-8	31 Aug 2021	Aviation
HSM-40	20 Sep 2021	Aviation
VX-9	4 Oct 2021	Aviation
VMFA-242	29 Oct 2021	Aviation
VP-4	15 Nov 2021	Aviation
VFA-192	21 Nov 2021	Aviation
HSM-78	24 Nov 2021	Aviation
VFA-113	28 Nov 2021	Aviation
VFA-137	2 Dec 2021	Aviation
Naval Aviation Schools Command	13 Apr 2021	Shore
NSWC Crane	27 Apr 2021	Shore
SERMC Jacksonville	30 Jul 2021	Shore
PSNS	30 Aug 2021	Shore
Naval Explosive Ordnance School	10 Sep 2021	Shore
VFA-32	11 Sep 2021	Shore
COMNAVAIRPAC	04 Oct 2021	Shore
Seal Team 8	12 Dec 2021	Shore
3rd MRB	23 Apr 2021	Marine
1st BN 7th Marines	04 May 2021	Marine
3rd BN 7th Marines	17 May 2021	Marine
CBIRF	14 Jun 2021	Marine
MARSOC	30 Jun 2021	Marine
FMTB-E	16 Jul 2021	Marine



Active Class A / Explosive SIB Reports, Cont.

RS Lansing	21 Jul 2021	Marine
8th ESB	28 Jul 2021	Marine
MARSOC	1 Aug 2021	Marine
SOI-W	25 Aug 2021	Marine
3rd BN 4th Marines	23 Sep 2021	Marine
1st LSB	24 Sep 2021	Marine
2nd BN 8th Marines	28 Oct 2021	Marine
3rd RECON	5 Nov 2021	Marine

PHOTO CREDITS

FRONT COVER
Feb. 19, 2022. Sailors and Marines aboard USS Portland (LPD 27), Pearl Harbor, Hawaii. U.S. Marine Corps photo by Gunnery Sgt. Donald Holbert

BACK COVER
Feb. 19, 2022. The U.S. flag waves above USS Portland (LPD 27), Pearl Harbor, Hawaii. U.S. Marine Corps photo by Gunnery Sgt. Donald Holbert

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Feb. 19, 2022. U.S. Marine, 11th MEU, aboard USS Portland (LPD 27), Pearl Harbor, Hawaii. U.S. Marine Corps photo by Gunnery Sgt. Donald Holbert

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Nov. 13, 2019. U.S. Marine Corps Cpl. Angela Chang, 11th MEU aboard USS Boxer (LHD 4), Pearl Harbor, Hawaii. U.S. Navy photo by Mass Communication Specialist 3rd Class Justin Whitley

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Feb. 21, 2022. Chief Gunner's Mate Benjamin Bartelmey and crew, aboard USS New Orleans (LPD 18), East China Sea. U.S. Navy photo by Mass Communication Specialist 1st Class Desmond Parks

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Feb. 24, 2022. An F/A-18E Super Hornet,VFA-81, launches from USS Harry S. Truman (CVN 75), Adriatic Sea. U.S. Navy photo by Mass Communication Specialist 2nd Class Kelsey Trinh

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Bottom: Feb. 19, 2022. U.S. Marines and Sailors, 11th MEU and USS Portland (LPD 27), Pearl Harbor, Hawaii. U.S. Marine Corps photo by 1st Lt. Austin Gallegos

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Top Left: Jan. 4, 2022. Aviation Machinist Mate Airman Jacob Thiedesmith, E-2D Advanced Hawkeye, VAW-113, USS Carl Vinson (CVN 70), Philippine Sea. U.S. Navy photo by Mass Communication Specialist 2nd Class Aaron T. Smith

Top Right: Feb. 11, 2022. Marine Staff Sgt. David Sigdestad, EOD technician, MWSS-171; Air Force Airman 1st Class Carter Peers, EOD technician, 36th Civil Engineer Squadron, Andersen Air Force Base, Guam. U.S. Marine Corps photo by Sgt. Booker Thomas

Middle right: Jan. 15, 2021. Female Engagement Team member, Special Purpose Marine Air-Ground Task Force – Crisis Response - Central Command, UAE. U.S. Marine Corps photo by Lance Cpl. Andrew Skiver

Bottom: July 6, 2021. Lt. j.g. Daniel Shultz, USS Mahan (DDG 72), Gulf of Oman. U.S. Navy photo by Mass Communication Specialist Seaman Ryan Childress

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Top Right: Oct. 20, 2021, MV-22 Osprey, VMM-263, USMC, USS Kearsarge (LHD 3). U.S. Marine Corps photo by Cpl. Yvonna Guyette

Middle Right: Jan. 5, 2022. Quartermaster Seaman Apprentice Aaliyah Mitchell, aboard USS Carl Vinson (CVN 70), Philippine Sea. U.S. Navy photo by Mass Communication Specialist Seaman Apprentice Joshua Sapien

Bottom-Middle of Page: Jan. 6, 2022. USS Minnesota (SSN 783), Submarine Base New London, Connecticut. U.S. Navy Photo by John Narewski

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Nov. 7, 2021. Chief Navy Diver Jesse Delapena, MDSU-2, SUPSALV, dive brief, Panama City, Florida. U.S. Navy photo by Chief Mass Communication Specialist Kathleen Gorby

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July 13, 2020. USS Bonhomme Richard (LHD 6) fire, San Diego, California. U.S. Navy photo by Mass Communication Specialist 1st Class Patrick W. Menah Jr.

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Feb. 10, 2020. Sailors with USS McFaul (DDG 74), USS Mason (DDG 87) and USS Bataan (LHD 5) perform rescue and assistance drill, General Dynamics NASSCO shipyard, Portsmouth, Virginia. U.S. Navy photo by Mass Communication Specialist 3rd Class Darren Newell

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Feb. 10, 2022. Aviation Ordnanceman 2nd Class Myles Brown, Aviation Electronics Mate 2nd Class Caroline Logan, HSC-28, Det. 7, MQ-8B Fire Scout UAV, USS Billings (LCS 15), Caribbean Sea. U.S. Navy photo by Mass Communication Specialist 3rd Class Aaron Lau

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Feb. 23, 2022. F-35C Lightning II, VMFA-314, USS Abraham Lincoln (CVN 72), Philippine Sea. U.S. Navy photo by Mass Communication Specialist 3rd Class Javier Reyes

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Bottom: Sep. 7, 2021. An F/A-18E Super Hornet, VFA-143 launches from USS George H.W. Bush (CVN 77), Atlantic Ocean. U.S. Navy photo by Mass Communication Specialist 3rd Class Brandon Roberson

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Nov. 06, 2020. An F/A-18E Super Hornet, VFA- 143 approaches the flight deck of USS George H.W. Bush (CVN 77). U.S. Navy photo by Mass Communication Specialist Seaman Ryan Hartman

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Nov. 29, 2021. Aviation Electrician's Mate Airman Leslie Lyon, VAQ-133, cleans EA-18G Growler aboard USS Abraham Lincoln (CVN 72), Pacific Ocean. U.S. Navy photo by Mass Communication Specialist Seaman Apprentice Jett Morgan

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Jan. 28, 2022. F-35B Lightning II, MFAT- 501, Boca Chica Field, Naval Air Station Key West, Florida. U.S. Navy photo by Mass Communication Specialist 2nd Class Nicholas V. Huynh

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Bottom: June 12, 2021. Cpl. Ulysses Santin, crew chief, MMTR – 363 Reinforced with MRF – Darwin, refuels MV-22B Osprey, Gove Airport, Nhulunbuy, NT, Australia. U.S. Marine Corps photo by Cpl. Lydia Gordon

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Bottom: June 3, 2021. Maritime Raid Force, 31st MEU, CH-53E

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Feb. 22, 2022. Civil Service Mariners attend Basic Training at MSC Training Center East, Joint Base Langley-Fort Eustis, Virginia. U.S. Navy photo by Bill Mesta

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Left: Oct. 13, 2021. Naval Branch Health Clinic's Audiology Clinic Jacksonville, Florida. U.S. Navy photo by Deidre Smith

Middle: Feb. 15, 2022. 5th Marine Regiment, 1st Marine Division, Humvee inspection, Marine Corps Base Camp Pendleton, California. U.S. Marine Corps photo by Cpl. Cameron Hermanet

Right: Jan. 20, 2022. Brian Hill, safety specialist, Naval Air Station Pensacola Safety Office, leads Personal Protective Equipment class during OSHA course, Florida. U.S. Navy photo by Joshua Cox

Pgs. 78-79
Left: March 7, 2022. Engineman 3rd Class Eric Pineda, MSRON 1, Maritime Expeditionary Security Group 1 Training Evaluation Unit, Point Mugu, California. U.S. Navy photo by Gunner's Mate 1st Class Christopher Olson

Center: Mar. 10, 2021. USS William P Lawrence (DDG 110) enters dry dock March 9, Pearl Harbor Naval Shipyard, Hawaii. U.S. Navy photo by Ashleigh Whitney

Pg. 80
March 1, 2022. OCS class 10-22, wet trainer, Officer Training Command, Newport, Rhode Island. U.S. Navy photo by Candidate Officer Christian Sana

Pg. 81
Jan. 31, 2022. Damage Controlman 3rd Class Nitzia Martinez stores SCBA aboard USS Carl Vinson (CVN 70), Philippine Sea. U.S. Navy photo by Mass Communication Specialist Seaman Larissa T. Dougherty

Pg. 82
May 25, 2021. Electrician's Mate 2nd Class Dalton Petty, USS Ross (DDG 71), Haakonsvern, Norway. U.S. Navy photo by Mass Communication Specialist 2nd Class Claire DuBois

Pg. 83
Feb. 7, 2022. Command fitness leadership course onboard NAF Atsugi, ATSUGI, Japan. U.S. Navy photo by Mass Communication Specialist 2nd Class Ange Olivier Clement

Pg. 85
Apr. 28, 2021. Capt. Scott Hardy, right, Commander, Fleet Activities Okinawa (CFAO) commanding officer, CFAO Zone Inspection Coordinator Aviation Maintenance Administrationman 1st Class Christopher Dela Cruz, left, air ops zone inspection, Camp Shields, Okinawa, Japan. U.S. Navy photo by Mass Communication Specialist 1st Class David R. Krigbaum

Pg. 86
Aug. 4, 2021. Mass Communication Specialist 3rd Class Jacob Vermeulen, audiogram, USS Kearsarge (LHD 3), Atlantic Ocean. U.S. Navy photo by Mass Communication Specialist 2nd Class Jamica Ballard

Pg. 87
Oct. 19, 2021. USS Milius (DDG 69), rear, and Japan Maritime Self-Defense Force JS Akizuki (DD 115),with USS Higgins (DDG 76), South China Sea. U.S. Navy photo by Mass Communication Specialist 3rd Class Christine Montgomery

Pg. 88
Jan. 7, 2022. USS Indiana (SSN 789), U.S. Coast Guard Cutter, Barque Eagle, Submarine Base New London, Groton, Connecticut. U.S. Navy Photo by John Narewski

Pg. 89
Sept. 25, 2021. Ens. Ashley Risk, USS Arlington (LPD 24), Atlantic Ocean. U.S. Navy photo by Mass Communication Specialist 2nd Class John Bellino

Pg. 90
Sept. 19, 2021. USS Carl Vinson (CVN 70), USS Lake Champlain (CG 57), and USS Chafee (DDG 90) Sailors receive passing honors from sailors of Japan Maritime Self-Defense Force JS Ikazuchi (DD 107) and JS Chōkai (DDG 176). U.S. Navy photo by Mass Communication Specialist 2nd Class Haydn N. Smith

Pg. 98
March 6, 2021. CH-53, HMH- 466 transports a mock F135 engine power module from USS Carl Vinson (CVN 70) to USNS Richard E. Byrd (T-AKE 4). U.S. Navy photo by Mass Communication Specialist 3rd Class Olympia O. McCoy

Pg. 99
Jan. 23, 2022. Navy Divers, West Coast Naval Special Warfare unit. U.S. Navy photo by Mass Communication Specialist 2nd Class Alex Perlman

Pg. 100
Nov. 22, 2021. Special warfare combatant-craft crewmen assigned to a Special Boat Team. U.S. Navy Photo by Mass Communication Specialist 1st Class Sean Furey

Pg. 101
Jan. 31, 2022. All Domain Reconnaissance Detachment, 11th MEU, Brooke's Point, Philippines. U.S. Marine Corps photo by Sgt. Jennessa Davey

Pgs. 102-103
Feb. 17, 2022. A Navy diver with MDSU-1 uses an exothermic cutting tool to remove the stern gunwale of a submerged 250-ton ship, Apra Harbor, Guam. U.S. Navy courtesy photo

Pgs. 104-105
Top: Nov. 22, 2021. Special warfare combatant-craft crewmen participate in training with Abraham Lincoln Carrier Strike Group. U.S. Navy Photo by Mass Communication Specialist 1st Class Sean Furey

Bottom: Nov.16, 2021. Navy Diver 3rd Class Brendan Cain, MDSU-2, Vasco Nunez de Balboa port, Panama. U.S. Navy photo by Chief Mass Communication Specialist Kathleen Gorby

Pgs. 106-107
Top, Bottom: May 4, 2016. Chief Navy Diver Michael West, and Explosive Ordnance Technician 1st Class Jay Smith; Naval Weapons Station, Yorktown, Virginia. U.S. Navy photo by Visual Information Specialist John W. Williams

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Feb. 4, 2022. U.S. Navy Sailors, Camp Lejeune, North Carolina. U.S. Marine Corps photo by Sgt. Adaezia Chavez.

Pg. 110
May 4, 2016. Lt. Jason Myers, Senior Chief Explosive Ordnance Technician Sean Smith, (left) Chief Navy Diver Frederick Taylor; Naval Weapons Station, Yorktown, Virginia. U.S. Navy photo by Visual Information Specialist Allan Amen

Pgs. 112 -113
April 4, 2020. Ens Lauren Castillo, USS Bunker Hill (CG 52); Philippine Sea. U.S. Navy photo by Mass Communication Specialist 3rd Class Nicholas V. Huynh

Pg. 114
Sept. 9, 2021. Jeff Jones, deputy director, NAVSAFECEN Safety Promotions, Hook '21 Conference, Reno, Nevada. U.S. Navy photo by Rebecca Coleman

Pgs. 116-117
Graphic created for NAVSAFECEN 2021 safety professional development line of effort. U.S. Navy graphic by Harland Robinson

Pgs. 118-119
Aug. 28, 2021. National Ensign, USS Green Bay (LPD 20). U.S. Navy photo by Mass Communication Specialist 2nd Class Darcy McAtee

Pg. 121
2021. Dave Deuel as Captain Dave. Once Upon a Mishap video series. U.S. Navy photo by NAVSAFECEN Safety Promotions

Pg. 122
"Complacency." NAVSAFECEN Safety Promotions

Pg. 123
March 15, 2012. USS Miami (SSN 755) enters dry dock, Portsmouth Naval Shipyard, Virginia. U.S. Navy photo by Jim Cleveland

Pgs. 124-125
July 12, 2020. USS Bonhomme Richard (LHD 6) fire, Naval Base San Diego, California. U.S. Navy Photo by Mass Communication Specialist 2nd Class Austin Haist

Pgs. 126-127
March 19, 2021. An MH-60S clears the surface after a nine-hour ascent from record depth. U.S. Navy photo by David Clark

Pg. 128
May 24, 2021. Company B, 3d Assault Amphibian Battalion, 4th Marines, 3rd MARDIV, waterborne operations with AAVs, Camp Schwab, Okinawa, Japan. U.S. Marine Corps photo by Lance Cpl. Diana Jimenez

Pg. 129
June 28, 2021. Co. A, 1st Battalion, 5th Marine Regiment, 1st MARDIV, exit an AAV-P7/A1 amphibious assault vehicle, Marine Corps Base Camp Pendleton, California. U.S. Marine Corps photo by Lance Cpl. Cameron Hermanet

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